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The psychological process of stereotyping: Content, forming, internalizing, mechanisms, effects, and interventions

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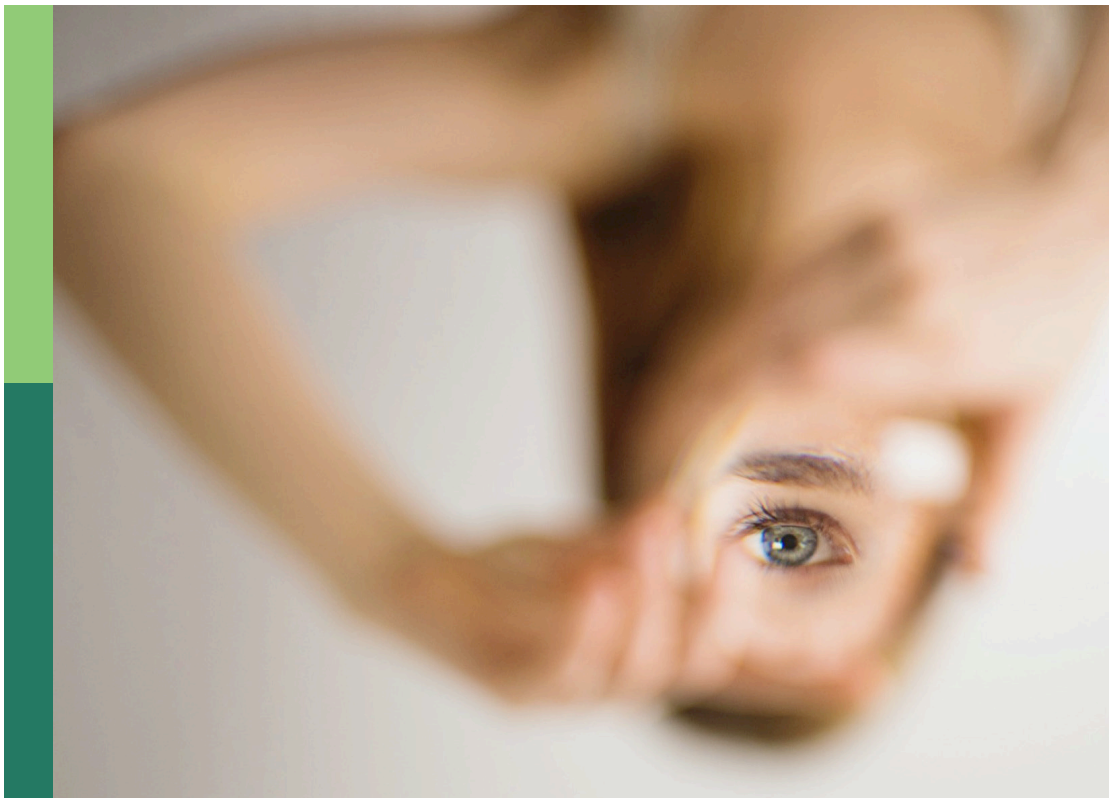

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The psychological process of stereotyping: Content, forming, internalizing, mechanisms, effects, and interventions

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Editorial: The psychological process of stereotyping: Content, forming, internalizing, mechanisms, effects, and interventions

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Editorial on the Research Topic
The psychological process of stereotyping: Content, forming, internalizing, mechanisms, effects, and interventions

Stereotype is a pervasive and persistent human tendency that stems from a basic cognitive need to categorize, simplify, and process the complex world. This tendency is a precondition for social bias, prejudice, and discrimination. Amid the COVID-19 outbreak, the discrimination, exclusion, and even hostility caused by stereotypes have increasingly become an important social issue that concerns political and social stability. Therefore, the current issue focuses on a broad spectrum of research addressing four main themes: (1) the psychological processes involved in forming and internalizing social stereotypes, (2) the negative consequences of stereotypes, (3) the neurocognitive mechanisms underlying stereotypes, and (4) the interventions addressing the consequences of negative stereotypes in this era with changes and challenges. Specifically, the Research Topic consists of 13 papers by 54 scholars that target stereotypes among different social groups, including males and females, older people and young generation, minority races, people living with HIV/AIDS (PLWHA), people with mental health problems, juvenile transgressors, refugees, and Asian-Americans during COVID-19 outbreak. These studies are conducted in culturally diverse countries including Brazil, China, Germany, Hungary, and the USA, contributing to a more holistic picture of contemporary stereotypes.

1. The forming of social stereotypes

Negative stereotypes from the public may be influenced by our knowledge about and psychological distance to the target group, beliefs of group malleability, beliefs in the implicit change of traits, and moral values. For instance, Caldas et al. tested whether people's knowledge and proximity to the circumstances associated with juvenile transgression would influence their opinions about the proposal for reducing the age of criminal majority in Brazil. They investigated the passers-by in a public square and workers from the juvenile justice courts and found that people were more likely to hold negative stereotypes of juvenile delinquents if they were far from them. Paskuj and Orosz focused on the refugees as the most typically vulnerable group in turbulent international times, and they found that group malleability beliefs were negatively linked to dehumanization tendencies and threats perceived from migrants in Hungary. Protzko and Schooler examined a more general negative stereotype of youth also known as the "kids these days effect" (KTD effect). In two studies with American adults, belief in whether a trait changes over the lifespan was associated with such prejudices. In addition, Lai et al. focused on three cues linked to women's perceived high long-term mating value and reported that Chinese women displaying "sexually attractive" cues were perceived to have lower moral values. Moreover, they were stereotyped as having lower levels of humanness than women displaying "beautiful" facial cues or "virtuous" behavioral cues, which in turn led to lower mating opportunity.

Culture also plays an essential role in stereotype formation. Li M. et al. targeted stereotypes toward high-power individuals and revealed that people influenced by Confucianism held positive stereotypes of competence and warmth for senior high-power individuals. This finding is inconsistent with the traditional proposition that high-power individuals tend to be stereotyped as having high competence and low warmth. This might be because high-power individuals under Confucian culture are expected to have great social responsibility and concern for the wellbeing of others. Furthermore, new stereotypes emerged as a result of COVID-19 in the global context. COVID-19 is a threat to physical health, and mental health, and various reports have indicated that COVID-19 is closely related to stigma and discrimination. Two studies examined the stereotypes related to COVID-19. Zhao et al. found that the prevalence of COVID-19-related negative stereotypes was low in China. Besides, the more people know about COVID-19, the fewer negative stereotypes associated with COVID-19 they reported. Daley et al. on the other hand reported that Asian-Americans were facing increasing challenges from different ethnic groups on social issues related to COVID-19 in the United States, and the increasing tendency to blame China for the pandemic was associated with stereotyping Asian people as more foreign.

2. The consequences of negative stereotypes

People's negative stereotypes will influence their behavioral inclinations toward the target groups, and even the law-making at a general level. For instance, Wen et al. tested space-related stereotypes associated with people living with HIV/AIDS (PLWHA). They found that people who held negative stereotypes toward the spaces occupied by PLWHA were more resistant to visit such spaces, and people's threat perception and community evaluation mediated the effects of such space-related stereotypes on community-approaching willingness. In addition, Caldas et al. found that the more distant people were from juvenile transgressors, the more they held negative stereotypes toward juvenile transgressors and agreed with the law-making proposal for reducing the age of criminal conviction in Brazil.

Vulnerable groups may internalize the negative stereotypes and be influenced by them. Gärtner et al. tested the self-stereotyping of people with mental illness and found that negative stereotypes of their warmth and competence dimensions led them to develop negative emotions and thus exhibit higher levels of active or passive self-harm than mentally healthy people. In addition, Li J. et al. were interested in the gender self-stereotyping among college students and noted that gender self-stereotyping was positively correlated with relational and personal self-esteem and further correlated with higher life satisfaction only in the male sample. That is, gender self-stereotyping was associated with a higher level of self-esteem and life satisfaction among male students, while this effect did not hold for women.

3. The neurocognitive mechanisms of stereotypes

The neurocognitive mechanisms of stereotypes were explored by Wu and Zhao. They used RS-fMRI degree centrality (RSDC), a graph theory-based network analysis, to detect how negative stereotypes work in the brain. In a test of math-related stereotypes among female university students, they found that the RSDC of different brain regions was affected, reflecting that stereotypes are the result of the action of the brain network as a whole. For instance, a decrease in RSDC in the left hippocampus is a response to stereotype-related stress, and an increase in RSDC in the posterior parietal region (PPC) is a reflection of self-relevant processes induced by stereotypes.

4. The interventions addressing the consequences of negative stereotypes

Finally, two studies tested interventions against negative stereotypes *via* intergenerational contact and cognitive training. Long et al. found that simply intergenerational contact, or even just imagining it, reduced negative stereotypes of older people and increased perspective-taking toward older people among young adults. Chen et al. used the traditional IAT to compare the effect of multiple vs. single cognitive training on aging stereotypes in 12–13-year-olds. They found that multiple training tasks and additional intervention training sessions are recommended as they could significantly prolong the positive effects of the intervention.

Overall, these 13 papers discussed various aspects of stereotype formation, consequences, mechanisms, and interventions. We hope these papers will inspire future researchers in developing theories and conducting new interventions against negative effects of stereotypes. Since the current era of "black swan incidents" and related social challenges create perfect conditions for stereotypes to thrive and intensify, researchers should continue exploring the psychological mechanisms behind emerging social stigma and negative stereotypes. Especially, the development of neuroscience will provide further opportunities to study the brain mechanisms of stereotypes from a more microscopic perspective. This combined with macroscopic psychosocial mechanisms will provide new ways of addressing the severe dangers of negative stereotypes across contexts, countries and times and benefit targeted interventions and policy making.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Coronavirus Disease 2019–Related Stigma in China: A Descriptive Study

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Coronavirus disease 2019 (COVID-19) tremendously impacts the physical and mental health of humans worldwide. Consequently, studies on COVID-19 remain extensive. However, most of them were mainly focused on the pathological mechanisms and treatment methods from medical perspectives. Various reports have indicated that COVID-19 is closely related to stigma and discrimination, but little statistical information has been integrated quantitatively to describe the situation in China. Thus, this study investigated the COVID-19-related stigma of individuals. We collected the online survey data from 1,920 Chinese participants from October to December 2020. Findings showed that 306 (15.94%), 285 (14.84%), 265 (13.80%), and 100 (5.21%) participants endorsed stigma toward individuals in high-risk areas, recovered patients with COVID-19, families of recovered patients with COVID-19, and frontline healthcare providers, respectively. To understand the possible factors that could impact the COVID-19-related stigma, knowledge about COVID-19 was investigated. Generally, knowledge about COVID-19 was negatively associated with COVID-19-related stigma in general, while no significant relationship existed between the knowledge about COVID-19 and the COVID-19-related stigma in the groups who had held COVID-19-related stigma. Ultimately, individuals showed COVID-19-related stigma toward recovered patients and their families, individuals in high-risk areas, and frontline healthcare providers to some extent. The results of this study can provide reference to nations, governments, and organizations in addressing the stigma issues raised by the COVID-19 pandemic.

Keywords: COVID-19, stigma, knowledge, China, descriptive study

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INTRODUCTION

Historically, infectious diseases posed a huge threat to the lives of people (Ackerman et al., 2018). Even at present, deaths from infectious diseases account for roughly one-quarter worldwide (World Health Organization, 2015). To mitigate the threat caused by various diseases, people have evolved the behavior immune system (BIS) (Schaller and Park, 2011; Taylor, 2019). The activation of the BIS has implications for the affective, cognitive, and behavioral responses of people at individual and group levels, such as devoting more visual attention to cues related to diseases (Ackerman et al., 2009; Stone and Potton, 2019), increasing intentions to use condoms in sexual attitudes (Tybur et al., 2011), producing more prejudices against out-groups (Kusche and Barker, 2019), and adopting more socially conservative values (Tybur et al., 2016).

Among these studies, one of the most intriguing and well-studied results of the BIS may be the stigma toward individuals possessing cues related to infectious disease (Ackerman et al., 2018).

The BIS has implications for prejudices against individuals who have diseases, such as HIV/AIDS, severe acute respiratory syndrome (SARS), and influenza A virus (H1N1) (Kurzban and Leary, 2001; Oaten et al., 2011; Murray and Schaller, 2016). Specifically, due to the BIS, individuals may—in facing cues related to diseases—trigger disgust, worry, and anger in affective responses, vulnerability beliefs and group stereotypes in cognitive responses, and avoidance and protection in behavioral responses (Ackerman et al., 2018). Therefore, coronavirus disease 2019 (COVID-19), as a novel infectious disease, may be stigmatized due to the protective function of psychological mechanisms of the BIS. Thus, in this study, whether there exists COVID-19-related stigma in China was investigated.

STIGMA

Stigma refers to a devalued social identity, which is associated with attributes and characteristics of stereotype, prejudice, and discrimination (Crocker et al., 1998). Stigma significantly and negatively affects individuals by decreasing self-esteem, interfering with family relationships, and limiting opportunities in the job market (Zolezzi et al., 2018). Therefore, a growing number of researchers focus on the stigma, such as weight stigma (Papadopoulos and Brennan, 2015; Hackman et al., 2016), homosexuality stigma (Preciado et al., 2013; Lelutiu-Weinberger et al., 2019), and illness stigma (Casados, 2017; Norman et al., 2017; Kosyluk et al., 2018; Caqueo-Urízar et al., 2020).

Among various types of stigmas, illness stigma can be divided into two main types. One is the mental illness stigma, such as schizophrenia, depressive, and anxiety disorders. For example, Wang et al. (2012) used an implicit association test and found that individuals tended to associate mental illness-related words (e.g., "depressive disorder") with negative words (e.g., "dangerous," "negative," "evil") on cognition, emotion, and behavioral tendency, which implied that individuals had an implicit stigma to mental illness. Additionally, studies on explicit stigma to mental illness also found that individuals held stigmatizing attitudes toward mental illness (Peris et al., 2008; Sandhu et al., 2019). Another type of illness stigma is the psychical illness stigma, particularly related to infectious diseases, such as HIV/AIDS, SARS, and TB (Mak et al., 2006; Williams et al., 2011; Wagner et al., 2017). For example, individuals who suffered from or were suspected of having HIV/AIDS had experienced various discriminations induced by stigma, such as disrespect, rejection, and being ignored by families, friends, or strangers (Crandall and Coleman, 1992; Herek, 1999). In 2003, SARS had spread to over 29 countries globally, and it was also associated with various forms of stigma, such as being shunned, insulted, marginalized, and excluded from society (Lee et al., 2005).

CORONAVIRUS DISEASE 2019–RELATED STIGMA

In recent decades, an increasing body of evidence has indicated that infectious diseases related to stigma have caused many serious social problems, with the emergence of a growing number of novel infectious diseases worldwide (Williams et al., 2011; Dubey et al., 2020). COVID-19 is a novel infectious disease that broke out in Wuhan, China in December 2019. Since then, COVID-19 swept all provinces of China and spread rapidly across the globe. According to the WHO, as of May 27, 2021, there have been 108,361 confirmed cases, with 4,881 deaths, in China. Even worse, 167,492,769 confirmed cases with 3,482,907 deaths have been reported globally (World Health Organization, 2021). To decelerate the spread of COVID-19, in addition to health organizations and governments recommending protective measures, the BIS of individuals triggers their various affective, cognitive, and behavioral responses to protect themselves (Makhanova and Shepherd, 2020). For example, that diseases related to disgust and avoidance behavior were positively associated with COVID-19 concern, which means that the more people perceived COVID-19 serious, the greater disgust they might feel toward COVID-19 and its related cues, the greater avoidance of touching others (Makhanova and Shepherd, 2020; Shook et al., 2020). These negative effects and behaviors conformed to the manifestations of stigma (Link and Phelan, 2001). In this case, as one of the most infectious diseases in history (Upadhyay et al., 2020), we assumed that COVID-19-related stigma exists.

However, as far as we know, few studies have investigated the COVID-19-related stigma based on an empirical study. Those few theoretical studies reported that many individuals, such as frontline healthcare providers and individuals who were living in high-risk zones, might experience negative attitudes caused by COVID-19 (Adja et al., 2020; Singh and Subedi, 2020). Additionally, these individuals suffered different kinds of discrimination, such as isolation, refusal of service, harassment, and bullying (Turner-Musa et al., 2020). Given these negative consequences caused by COVID-19-related stigma, individuals who have or are suspected of COVID-19 infection tend to lag in seeking medical care or even hide their illness, which will threaten the safety of others and increase the difficulty in containing the epidemic (Dubey et al., 2020). Therefore, this study aims to investigate whether and to what extent the COVID-19-related stigma exists in China to provide evidence for the interventions of COVID-19-related stigma and further help control the spread.

We hypothesized that COVID-19-related stigma exists in China. Specifically, individuals endorse stigma toward recovered patients with COVID-19, their families, friends, neighbors, and frontline healthcare providers, and individuals in high-risk areas (H_1). Moreover, stigma related to infectious diseases was negatively associated with infectious diseases-related knowledge (Balfour et al., 2010; Farotimi et al., 2015; Fischer et al., 2019). Therefore, a negative relationship between the COVID-19-related stigma and the knowledge about COVID-19 exists (H_2).

MATERIALS AND METHODS

Participants and Procedures

The Chinese professional survey website Wenjuanxing (www.wjx.cn, which is similar to SurveyMonkey) was used to collect the data. In this study, a survey, which contained the

TABLE 1 | Demographic characteristics of the sample ($N = 1,920$).

Demographic variables		*N*	%
Gender	Male	827	43.07
	Female	1,093	56.93
Education level	High school and below	25	1.30
	College	309	16.09
	Bachelor's degree	1,495	77.87
	Master's degree and above	91	4.74
Age (years)	16–20	1,452	75.63
	21–30	379	19.74
	31–40	73	3.80
	41–54	16	0.83
Social class	1	42	2.19
	2	88	4.58
	3	243	12.66
	4	322	16.77
	5	602	31.35
	6	350	18.23
	7	176	9.17
	8	47	2.45
	9	12	0.62
	10	38	1.98

questionnaire (see details in the "Measures" section), was built on Wenjuanxing and a link was created for it. Then, the link to the survey, accompanied by a brief introduction, was distributed to three participant pools *via* two social network sites, namely, WeChat and QQ (which are similar to Twitter). If individuals were interested in the survey, they could participate through the Wenjuanxing link and help us share the link and introduction of the survey with others if they decide to. Given that this study aimed to describe the situation of COVID-19-related stigma in China, we surveyed as many participants as possible to collect the data. A total of 2,239 participants from 26 provinces in China participated in the survey. The exclusion criteria were as follows: (1) under 16 years of age; (2) response time was <3 min; (3) there were missing data; and (4) response regularly, which means participants made the same choice for all items. Resultantly, 319 questionnaires were removed, leaving 1,920 questionnaires in the final analyses. The mean age of the sample was 20.51 years ($SD = 4.51$ years) and ranged from 16 to 54 years. The detailed demographic characteristics are presented in **Table 1**.

Measures

The questionnaire used in this study involved three sections:

Demographic Information

Participants were asked to fill in the information regarding their age, gender, hometown province, education level, and subjective social class. The subjective social class was measured using the MacArthur Scale of Subjective Socioeconomic Status (Adler et al., 2000). This scale is a ladder that has 10 rungs. Each rung represents a different level of social class. Participants were told that the bottom of the ladder represents the lowest social class, which means their income, degree of education, and occupation are at the lowest level, and the top of the ladder represents the highest social class, which means their income, degree of education, and occupation are at the highest level. Based on their true social classes, participants were asked to indicate which level of the ladder they belong to.

Coronavirus Disease 2019–Related Stigma

To measure the COVID-19-related stigma, a one-dimensional stigma scale was adopted following the study of Mak et al. (2006). It contains 14 items to assess the COVID-19-related stigma of participants from the following three aspects: affective response (5 items, e.g., "recovered COVID-19 patients are a nuisance" if it is to report the impression to recovered patients with COVID-19. The following examples of items used the same group.), cognitive response (3 items, e.g., "It is only normal that recovered COVID-19 patients are being discriminated against by other people"), and behavioral intention (6 items, e.g., "I will try to keep my distance with recovered COVID-19 patients as much as possible"). Specifically, there were 7 sub-questions corresponding to the 7 target groups under each item in the survey. Moreover, each sub-question had a 6-point scale ranging from 1 (strongly disagree) to 6 (strongly agree). For example, one of the items in the survey is that "I will try to keep my distance with the following groups as much as possible." Under this item, participants reported their impression toward each target group (7 times in total) on the 6-point scale. After the participants finished the survey, the stigma of participants toward each target group was calculated separately based on the calculation used by Mak et al. (2006). Specifically, after reversing appropriate items (i.e., items 6, 9, 10, 13, and 14), the stigma scores were defined as the mean score of all 14 items, and a higher score represented a higher level of stigma related to COVID-19.

Ultimately, not only infected individuals, but also their families, friends, and neighbors, frontline healthcare providers, and individuals in high-risk areas were vulnerable to stigma (Adja et al., 2020; Singh and Subedi, 2020). To investigate the COVID-19-related stigma, stigma toward these six groups was measured in this study. Additionally, stigma toward individuals who were not related to COVID-19 was measured as the control group. In this study, individuals not related to COVID-19 refer to healthy individuals who were not infected with COVID-19 and were not families, friends, or neighbors of patients with COVID-19. Therefore, a total of seven groups were investigated in this study. In the study of Mak et al. (2006), the values of Cronbach's α of the stigma scale were 0.85, 0.81, and 0.83 for HIV/AIDS, SARS, and TB, respectively. In this study, the internal consistency coefficient of the whole scale was good (Cronbach's $\alpha = 0.96$). Specifically, for the recovered patients with COVID-19, families of recovered patients with COVID-19, neighbors of recovered patients with COVID-19, friends of recovered patients with COVID-19, frontline healthcare providers, individuals in high-risk areas, and individuals not related to COVID-19, the values of Cronbach's α were 0.80, 0.79, 0.80, 0.80, 0.77, 0.78, and 0.76, respectively.

TABLE 2 | Descriptive results of the coronavirus disease 2019 (COVID-19)-related stigma scores ($N = 1,920$).

Variables	*M*	*SD*	*N* (%)			
			1 ≤ score ≤ 2	2 < score ≤ 3	3 < score ≤ 4	4 < score ≤ 5
Recovered patients	2.35	0.64	644 (33.54%)	991 (51.61%)	268 (13.96%)	17 (0.89%)
Recovered patients' families	2.31	0.63	691 (35.99%)	964 (50.21%)	251 (13.07%)	14 (0.73%)
Recovered patients' neighbors	2.28	0.63	726 (37.81%)	948 (49.38%)	234 (12.19%)	12 (0.62%)
Recovered patients' friends	2.26	0.64	757 (39.43%)	925 (48.18%)	226 (11.77%)	12 (0.62%)
Frontline healthcare providers	2.03	0.60	1,021 (53.18%)	779 (40.57%)	118 (6.15%)	2 (0.10%)
Individuals in high-risk areas	2.38	0.65	626 (32.60%)	988 (51.46%)	286 (14.90%)	20 (1.04%)
Individuals not related to COVID-19	1.97	0.58	1,106 (57.60%)	714 (37.19%)	98 (5.11%)	2 (0.10%)

Score means the stigma score of participants. The COVID-19-related stigma was measured on a 6-point scale.

TABLE 3 | Correlations between different types of COVID-19-related stigma ($N = 1,920$).

Variables	1	2	3	4	5	6	7
1. Recovered patients	–	[0.943,0.968]	[0.914,0.944]	[0.900,0.933]	[0.735,0.784]	[0.737,0.793]	[0.661,0.723]
2. Recovered patients' families	0.96***	–	[0.970,0.982]	[0.960,0.974]	[0.764,0.811]	[0.768,0.817]	[0.693,0.756]
3. Recovered patients' neighbors	0.93***	0.98***	–	[0.983,0.989]	[0.776,0.821]	[0.772,0.821]	[0.724,0.783]
4. Recovered patients' friends	0.92***	0.97***	0.99***	–	[0.782,0.827]	[0.771,0.822]	[0.733,0.792]
5. Frontline healthcare providers	0.76***	0.79***	0.80***	0.81***	–	[0.684,0.743]	[0.793,0.837]
6. Individuals in high-risk areas	0.77***	0.79***	0.80***	0.80***	0.71***	–	[0.618,0.684]
7. Individuals not related to COVID-19	0.69***	0.73***	0.76***	0.76***	0.82***	0.65***	–

****p < 0.001.*

Knowledge About COVID-19

Two items scored on a 10-point Likert scale from 1 (strongly unfamiliar) to 10 (strongly familiar) were adopted from the study of Khasawneh et al. (2020) to assess the degree of the knowledge of participants about COVID-19 (i.e., "the knowledge of potential sources of transmission of COVID-19" and "the knowledge of potential risk factors and virulence of COVID-19").

RESULTS

Descriptive Results of the COVID-19-Related Stigma Scores

The descriptive statistics on stigma toward COVID-19, such as recovered patients with COVID-19, families of recovered patients with COVID-19, neighbors of recovered patients with COVID-19, friends of recovered patients with COVID-19, frontline healthcare providers, individuals in high-risk areas, and individuals not related to COVID-19, are shown in **Table 2**. The same criterion (i.e., score > 3), as used in the study of Mak et al. (2006), was adopted to indicate that participants endorsed stigmatizing perceptions toward target groups. Although the average stigma scores of participants for these seven groups were all <3 in this study, 306 (15.94%), 285 (14.84%), and 265 (13.80%) participants endorsed stigma (score > 3) toward individuals in high-risk areas, recovered patients with COVID-19, and families of recovered patients with COVID-19, respectively. Additionally, only 120 (6.25%) and 100 (5.21%) participants had stigmatizing perceptions toward individuals not related to COVID-19 and frontline healthcare providers, respectively.

Correlations Among COVID-19-Related Stigma Scores

The correlations among COVID-19-related stigmas to the seven groups are presented in **Table 3**. The stigma scores of these seven groups, such as recovered patients with COVID-19, families of recovered patients with COVID-19, neighbors of recovered patients with COVID-19, friends of recovered patients with COVID-19, frontline healthcare providers, individuals in high-risk areas, and individuals not related to COVID-19, had significantly positive relationships with one another (r ranges from 0.65 to 0.99).

Knowledge and COVID-19-Related Stigma

The descriptive analysis of the knowledge of participants about (i.e., sources and risk factors) COVID-19 showed that the level of knowledge among participants toward possible sources of COVID-19 transmission ($M = 6.79$, $SD = 1.73$) and potential risk factors for COVID-19 infection ($M = 6.91$, $SD = 1.78$) was not high. The distributions of the knowledge about COVID-19 transmission and infection are shown in **Table 4**.

The correlations between the knowledge about COVID-19 and the COVID-19-related stigma are presented in **Table 5**. Based on the whole dataset, the possible sources of COVID-19 transmission and the possible risk factors for COVID-19

TABLE 4 | Descriptive results of the knowledge about COVID-19 ($N = 1,920$).

Transmission	*N*	%	Infection	*N*	%
1	10	0.50	1	9	0.50
2	12	0.60	2	14	0.70
3	27	1.40	3	36	1.90
4	85	4.40	4	80	4.20
5	342	17.80	5	289	15.10
6	326	17.00	6	316	16.50
7	466	24.30	7	465	24.20
8	477	19.60	8	384	20.00
9	110	5.70	9	136	7.10
10	165	8.60	10	191	9.90

The knowledge about COVID-19 was measured on a 10-point scale.

TABLE 5 | Correlations between the knowledge about COVID-19 and the COVID-19-related stigma ($N = 1,920$).

Variables	Knowledge about COVID-19	
	Possible sources of COVID-19 transmission	Potential risk factors for COVID-19 infection
Recovered patients	−0.14***	−0.14***
Recovered patients' families	−0.14***	−0.15***
Recovered patients' neighbors	−0.14***	−0.14***
Recovered patients' friends	−0.14***	−0.14***
Frontline healthcare providers	−0.12***	−0.12***
Individuals in high-risk areas	−0.13***	−0.14***
Individuals not related to COVID-19	−0.13***	−0.12***

****p < 0.001.*

infection were negatively associated with the stigma toward COVID-19, such as recovered patients with COVID-19, families of recovered patients with COVID-19, neighbors of recovered patients with COVID-19, friends of recovered patients with COVID-19, frontline healthcare providers, individuals in high-risk areas, and individuals not related to COVID-19 (r ranges from −0.12 to −0.15).

The average stigma scores of participants for these seven groups were all <3 in this study, which implied that participants did not endorse the COVID-19-related stigma from the perspective of the whole data. Therefore, to identify the possible sources of and factors that impact stigma, a series of new datasets was composed based on the original dataset when a stigma score of the participant was >3. The specific sample size for each group is shown in **Table 6**.

Based on the series of new datasets, the correlations between the knowledge about COVID-19 and the COVID-19-related stigma are presented in **Table 6**. The possible sources of COVID-19 transmission and the possible risk factors for COVID-19 infection were not significantly associated with the COVID-19-related stigma.

Given that the results of the whole dataset of stigma differed from those of the data when the stigma scores were >3, the correlations between the knowledge about COVID-19 and the dataset when the stigma scores were ≤3 were analyzed (**Table 7**). The possible sources of COVID-19 transmission and the possible risk factors for COVID-19 infection were all negatively associated with the COVID-19-related stigma, such as recovered patients with COVID-19, families of recovered patients with COVID-19, neighbors of recovered patients with COVID-19, friends of recovered patients with COVID-19, frontline healthcare providers, individuals in high-risk areas, and individuals not related to COVID-19 (r ranges from −0.12 to −0.15).

Differences of COVID-19-Related Stigma on Demographic Variables

Based on the series of new datasets, the results of analyses on the differences of COVID-19-related stigma on demographic variables are as follows (**Table 8**): no significant differences existed between men and women on the COVID-19-related stigma, except that men ($M = 3.43$, $SD = 0.34$) endorsed a significantly higher level of stigma toward neighbors of recovered patients with COVID-19 than women ($M = 3.35$, $SD = 0.27$), $t_{(244)} = 2.19$, $p = 0.03$, Cohen's d (i.e., the effect size) = 0.26, which was small based on the Cohen's conventions (Cohen, 1988). No significant differences existed among different ages on the COVID-19-related stigma. No significant differences existed among different education levels on the COVID-19-related stigma, except that significant differences existed among different educations on stigma toward recovered patients with COVID-19, $F_{(3,281)} = 4.82$, $p = 0.003$, partial η^2 (i.e., the effect size) = 0.05, which was small. The *post hoc* (Bonferroni) tests revealed that participants with the education level of master's degree and above ($M = 3.59$, $SD = 0.46$) endorsed a higher degree of stigma toward recovered patients with COVID-19 than undergraduate participants ($M = 3.37$, $SD = 0.30$), $p = 0.008$. No significant differences existed among different subjective social classes on the COVID-19-related stigma, except that there were significant differences among different subjective social classes on stigma toward neighbors of recovered patients with COVID-19, $F_{(2,243)} = 4.79$, $p = 0.009$, partial $\eta^2 = 0.04$, which was small. The *post hoc* (Bonferroni) tests revealed that participants who reported that their subjective social classes were 8–10 ($M = 3.56$, $SD = 0.30$) endorsed a higher level of stigma toward neighbors of recovered patients with COVID-19 than participants who reported that their subjective social classes were 4–7 ($M = 3.36$, $SD = 0.29$), $p = 0.046$.

DISCUSSION

General Description of COVID-19-Related Stigma in China

Coronavirus disease 2019 has jeopardized human lives and societies worldwide. Resultantly, many researchers had conducted medical studies on COVID-19 (Ahn et al., 2020; Chakraborty et al., 2020; Landete et al., 2020; Wan et al., 2020). However, few researchers have conducted empirical studies

TABLE 6 | Correlations between the knowledge about COVID-19 and the COVID-19-related stigma (stigma score > 3).

Variables	Knowledge about COVID-19	
	Possible sources of COVID-19 transmission	Potential risk factors for COVID-19 infection
Recovered patients ($n = 285$)	0.02 ($p = 0.69$)	0.02 ($p = 0.74$)
Recovered patients' families ($n = 265$)	0.02 ($p = 0.65$)	0.03 ($p = 0.60$)
Recovered patients' neighbors ($n = 246$)	0.07 ($p = 0.26$)	0.09 ($p = 0.15$)
Recovered patients' friends ($n = 238$)	0.06 ($p = 0.34$)	0.07 ($p = 0.27$)
Frontline healthcare providers ($n = 120$)	0.05 ($p = 0.57$)	0.03 ($p = 0.74$)
Individuals in high-risk areas ($n = 306$)	−0.01 ($p = 0.94$)	−0.01 ($p = 0.92$)
Individuals not related to COVID-19 ($n = 100$)	0.04 ($p = 0.71$)	0.05 ($p = 0.59$)

TABLE 7 | Correlations between the knowledge about COVID-19 and the COVID-19-related stigma (stigma score ≤ 3).

Variables	Knowledge about COVID-19	
	Possible sources of COVID-19 transmission	Potential risk factors for COVID-19 infection
Recovered patients ($n = 1,635$)	−0.14 ($p < 0.001$)	−0.15 ($p < 0.001$)
Recovered patients' families ($n = 1,655$)	−0.15 ($p < 0.001$)	−0.14 ($p < 0.001$)
Recovered patients' neighbors ($n = 1,674$)	−0.14 ($p < 0.001$)	−0.14 ($p < 0.001$)
Recovered patients' friends ($n = 1,682$)	−0.15 ($p < 0.001$)	−0.15 ($p < 0.001$)
Frontline healthcare providers ($n = 1,800$)	−0.14 ($p < 0.001$)	−0.13 ($p < 0.001$)
Individuals in high-risk areas ($n = 1,614$)	−0.15 ($p < 0.001$)	−0.15 ($p < 0.001$)
Individuals not related to COVID-19 ($n = 1,820$)	−0.13 ($p < 0.001$)	−0.12 ($p < 0.001$)

regarding the COVID-19-related stigma, while various media reports suggested that stigma and discrimination cases related to COVID-19 were common globally, such as America, Nepal, Jordan, India, Italy, and China (Aacharya and Shah, 2020; Chopra and Arora, 2020; Khasawneh et al., 2020; Sahoo et al., 2020; Singh and Subedi, 2020; Turner-Musa et al., 2020). Thus, this study quantified the COVID-19-related stigma in China.

Fundamentally, H_1 was supported. It was found that the prevalence of COVID-19-related stigma was low in China (14.84% of participants endorsed stigma toward recovered patients with COVID-19). One of the possible reasons is that the stigma belongs to a social issue, which means that the responses of participants in the questionnaires might be affected by the social desirability effect and concealed their true attitudes toward groups related to stigma. Thus, they might be particularly cautious when they chose options with scores >3 on the stigma scale, indicating that the sample of the stigma data >3 was small. However, the results in this study were worse than on SARS- and TB-related stigma in previous studies (Link and Phelan, 2001; Mak et al., 2006), which indicated that the percentage of participants who endorsed stigmatizing perceptions toward SARS and TB were 3.7 and 4.9%, respectively. This inconsistency might be because, during the COVID-19 outbreak, the regional lockdown programs had been enforced in China to block the possible chains of transmission wherein people were stayed at home to avoid contact with others, which conformed to the behavioral response of stigma (Mak et al., 2006). Moreover, this study showed that participants endorsed similar stigma toward families (13.80%), neighbors (12.81%), and friends (12.40%) of recovered patients with COVID-19 to participants endorsed stigma toward recovered patients. Furthermore, the distributions of COVID-19-related stigma toward recovered patients, and their families, neighbors, friends, and individuals in high-risk areas, had similar structures. The distributions of COVID-19-related stigma to frontline healthcare providers and individuals not related to COVID-19 were similar and had different types of structures. As expected, based on the BIS, one of its characteristics is overgeneralization, which indicates that the BIS has the tendency to be oversensitive or overgeneralized to cues related to diseases, even in cases where disease threats are absent (Ackerman et al., 2018). Just as the "smoke detector principle" (Nesse, 2005), all of the infectious or non-infectious psychical and mental abnormalities are regarded by the BIS as dangerous signals (Ackerman et al., 2018). Thus, although families, neighbors, and friends of recovered COVID-19 patients are not infected with COVID-19, the magnitude of the correlations between recovered patients and their families, neighbors, and friends is strong (r ranges from 0.92 to 0.99), which implied that they might have a higher probability of infection than others who are not related to recovered patients, and then the BIS may trigger psychological responses related to stigmatization, such as disgust and avoidance. These results uncovered that we should not only pay attention to patients with COVID-19 but also focus on their families, neighbors, and friends, who are likely to be ignored in the future.

This study unveiled that participants also reported a higher level of stigma toward individuals in high-risk areas (15.94%) than recovered patients with COVID-19 (14.84%). In addition to the effects of BIS on stigma as mentioned earlier, another possible reason for this may be that patients with COVID-19 who have recovered in this study were perceived by participants to be safer than the individuals in high-risk areas in which many people may be infected with the virus. Therefore, participants might be more afraid of individuals in high-risk areas than recovered patients with COVID-19 and be more likely to avoid them, which might eventually lead to greater stigma scores for individuals in high-risk areas. Additionally, during the COVID-19 pandemic, various media have reported incidents of the stigmatization of frontline

TABLE 8 | The differences between main variables regarding different individuals-related stigma toward COVID-19.

Variables		RP (n = 285)		RPFM (n = 265)		RPN (n = 246)		RPF (n = 238)		FHP (n = 120)		IHRA (n = 306)		INRC (n = 100)	
		Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*	Score *M* (*SD*)	*t*
Gender	Male	3.44 (0.36)	1.60	3.40 (0.33)	1.30	3.43 (0.34)	2.19*	3.43 (0.33)	1.97	3.38 (0.28)	1.73	3.44 (0.36)	0.69	3.32 (0.26)	−0.76
	Female	3.37 (0.30)		3.35 (0.29)		3.35 (0.27)		3.35 (0.27)		3.30 (0.22)		3.41 (0.31)		3.36 (0.24)	
			F		*F*		*F*		*F*		*F*		*F*		*F*
Age	16–20	3.38 (0.32)	1.71	3.35 (0.29)	2.25	3.37 (0.31)	0.89	3.37 (0.30)	1.54	3.33 (0.25)	0.25	3.39 (0.30)	1.91	3.35 (0.26)	0.98
	21–30	3.35 (0.33)		3.46 (0.36)		3.45 (0.34)		3.46 (0.34)		3.37 (0.30)		3.49 (0.41)		3.31 (0.26)	
	31–40	3.49 (0.36)		3.36 (0.30)		3.36 (0.25)		3.34 (0.25)		3.38 (0.17)		3.52 (0.39)		3.19 (0.09)	
	41–54	3.48 (0.48)		3.24 (0.15)		3.28 (–)		3.29 (-)		– (–)		3.39 (0.22)		3.50 (–)	
Education Level	High school and below	3.61 (0.43)	4.82**	3.47 (0.46)	1.53	3.40 (0.45)	1.10	3.44 (0.46)	0.58	– (–)	2.37	3.55 (0.49)	2.37	– (–)	1.44
	College	3.46 (0.33)		3.40 (0.31)		3.40 (0.30)		3.40 (0.30)		3.40 (0.28)		3.42 (0.32)		3.40 (0.28)	
	Bachelor's degree	3.37 (0.30)		3.35 (0.29)		3.38 (0.29)		3.38 (0.29)		3.31 (0.23)		3.41 (0.32)		3.30 (0.24)	
	Master's degree and above	3.59 (0.46)		3.48 (0.43)		3.52 (0.43)		3.48 (0.42)		3.46 (0.40)		3.60 (0.46)		3.36 (0.30)	
Social Class	1–3	3.46 (0.37)	2.29	3.42 (0.35)	2.77	3.46 (0.37)	4.79**	3.44 (0.34)	2.42	3.44 (0.32)	2.90	3.49 (0.37)	1.40	3.42 (0.31)	1.47
	4–7	3.38 (0.32)		3.35 (0.30)		3.36 (0.29)		3.37 (0.30)		3.31 (0.22)		3.41 (0.33)		3.32 (0.23)	
	8–10	3.52 (0.31)		3.51 (0.29)		3.56 (0.30)		3.51 (0.31)		3.39 (0.28)		3.42 (0.29)		3.29 (0.27)	

*RP, recovered patients with COVID-19; RPFM, recovered COVID-19 patients' family members; RPN, recovered COVID-19 patients' neighbors; RPF, recovered COVID-19 patients' friends; FHP, frontline healthcare providers; IHRA, individuals in high-risk areas; INRC, individuals not related to COVID-19. *$p < 0.05$, **$p < 0.01$.*

healthcare providers worldwide, such as Mexico, Malawi, India, and the United States (Bagcchi, 2020; Grover et al., 2020). In this study, only 100 (5.21%) participants had stigmatizing perceptions of frontline healthcare providers. The reason may be that the traditional Chinese culture emphasizes "*do not forget what other people have done for you*" (Xu et al., 2018). With that mindset, frontline healthcare providers volunteered and exerted their best to provide healthcare for patients in China (Liu et al., 2020), influencing most Chinese to be grateful for them, instead of stigmatizing and discriminating against them. Future studies should investigate gratefulness (as well as stigma) in order to provide a fuller picture of the perception of healthcare providers. Additionally, future studies should investigate the stigma of individuals toward frontline healthcare providers in other cultural contexts.

To identify the possible factors that impact the COVID-19-related stigma, this study explored the relationship between the knowledge about COVID-19 and the COVID-19-related stigma. H_2 was partially supported. The results showed that knowledge was negatively related to COVID-19-related stigma based on the whole dataset. Specifically, the less knowledge about COVID-19 participants had, the more COVID-19-related stigma they endorsed. However, after removing the data of stigma scores that were $\leq$3, this study found that no significant association existed between the knowledge about COVID-19 and the COVID-19-related stigma, which was inconsistent with previous studies (Svensson and Hansson, 2016; Lopez et al., 2018). Based on previous studies, a significantly negative relationship existed between knowledge and stigma. Given that the results of the whole stigma data differed from those of the stigma data $>$3, we further analyzed the relationship between the knowledge about COVID-19 and the stigma data $\leq$3. The results revealed that a significantly negative relationship existed between the knowledge about COVID-19 and the COVID-19-related stigma, which implied that the more knowledge about COVID-19 participants had, the less degree of stigmatization toward COVID-19 they endorsed. In summary, there might be a significantly negative relationship between the knowledge about COVID-19 and the COVID-19-related stigma, and the lack of significant findings on the subset of the data when the stigma scores were larger than 3 may be due to the limited range of scores. However, future studies should be cautious when using this conclusion.

Finally, this study explored whether demographic differences exist in COVID-19-related stigma. The results showed that gender, age, education level, and social class minimally affected the COVID-19-related stigma of individuals. This study found that participants with master's degree or higher education level endorsed higher degrees of stigma toward recovered patients with COVID-19 than undergraduate participants. In addition, participants who reported that their subjective social classes were 8–10 endorsed the higher levels of stigma toward neighbors of recovered patients with COVID-19 than participants who reported that their subjective social classes were 4–7. A higher subjective social class represents individuals who have higher incomes, degrees of education, and occupations. Thus, the two findings implied that people who have a higher level of education may hold a higher level of COVID-19-related stigma, which was inconsistent with the study of Johnco and Rapee (2018), which found that a negative association existed between education and stigma toward patients with diseases. Based on the abovementioned findings, given that a significantly negative relationship existed between the knowledge about COVID-19 and the degree of the COVID-19-related stigma, individuals who have a higher level of education might gain more knowledge about COVID-19 and should have endorsed less COVID-19-related stigma. Thus, we failed to explain the reasons for the results in this study. However, as Williams et al. (2011) mentioned, "disease-related stigma persists in spite of education and often without rationale" (p. 68), the relationship between disease-related stigma and education requires further investigation.

Limitations

This study holds certain limitations. First, based on previous studies on stigma toward mental illness (Michaels and Corrigan, 2013; Latkin et al., 2017), the responses of participants in this study might be affected by the social desirability effect given that this study used questionnaires, which might influence the accuracy of the results. Therefore, to reduce the social desirability effect, the COVID-19-related stigma of participants should be investigated using indirect measures, such as implicit association tests (Greenwald et al., 1998). Second, 120 (6.25%) and 100 (5.21%) participants had stigmatizing perceptions toward individuals not related to COVID-19 and frontline healthcare providers, respectively. The results show the complexity of studying stigma. People somewhat have stigmas toward others. Thus, the values of 6.25 and 5.21% can be used as a baseline to evaluate the situations of COVID-19-related stigma in China. Future studies should pay attention to this baseline. Third, this study used the convenience sampling method, instead of the random sampling method. Most participants were university students, which leads to the uneven distribution of the sample by age and education. Therefore, the generalizability of the results may be limited, and the reliability of the results may be influenced. Future studies are suggested to investigate the COVID-19-related stigma based on children and elder individuals. Fourth, the recovered patients with COVID-19 and their families, friends, and neighbors were studied in this study. Moreover, whether the patients with COVID-19 undergoing rehabilitation and their families, friends, and neighbors experience more stigma should be studied given that they may be considered more dangerous than recovered patients with COVID-19 and their families, friends, and neighbors by other individuals. Furthermore, only two self-assessment questions were used to assess the degree of the knowledge of participants about COVID-19, which may not fully reflect the knowledge of participants about COVID-19 and may further cause the mixed results of the correlation between the knowledge about COVID-19 and its related stigma. Although there were studies measuring the knowledge of participants about medical health using the same two questions (e.g., Sørensen et al., 2012; Wang et al., 2018), future studies are suggested to use more questions and objective indicators to assess the knowledge of people about COVID-19. For example, the questions can

be requiring participants to assess their knowledge about dissemination channels of transmission of COVID-19, such as from the air, animal, contaminated food, skin contact, and blood transfusion (Khasawneh et al., 2020). Finally, this study tested only the role of knowledge, but more potentially relevant individual characteristics exist that may impact COVID-19-related stigma in the pandemic. For example, Xu and Cheng (2021) indicated that political ideology, self-control, need for cognition, and risk attitude (health/safety risk-averse) were correlated with the attitudes of individuals toward COVID-19. Additionally, a core cognitive function, namely, working memory, was explored, and the working memory capacity predicted individual differences in social distancing compliance during the COVID-19 pandemic (Xie et al., 2020). Particularly, the higher working memory capacity that participants had, the more social distancing compliance they showed. Thus, these factors should be explored in the future.

Coronavirus disease 2019–related stigma has posed a serious threat to the psychical and mental health of individuals and the whole society. Therefore, we hope that the government, researchers, and general population pay attention to the treatment of COVID-19 itself while focusing on the negative social issues induced by the COVID-19-related stigma, especially its preventions and interventions (Stangl et al., 2019). For example, given that the COVID-19-related stigma is attributable to the unscientific belief and improper understanding of individuals (Bagcchi, 2020), it might be helpful for health professionals to recommend reliable and scientific information related to COVID-19 to expand the knowledge of individuals about COVID-19 to reduce or eliminate the COVID-19-related stigma.

CONCLUSION

This study examined the COVID-19-related stigma in China. Ultimately, not only recovered patients with COVID-19 were susceptible to stigma, but also families, neighbors, friends of recovered patients with COVID-19, frontline healthcare providers, and individuals in high-risk areas. Moreover, there might be a significantly negative relationship between the knowledge about COVID-19 and the COVID-19-related stigma. Specifically, the knowledge about COVID-19 was negatively associated with the COVID-19-related stigma. A higher level of knowledge about COVID-19 might lead to a lower level of COVID-19-related stigma, although no significant relationship existed between the knowledge about COVID-19 and the COVID-19-related stigma in the groups who have held COVID-19-related stigma.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

LZ, ZW, and JG: conception and design. PS and ZW: administrative support. LZ, WZ, and PS: provision of study materials. ZW, LZ, GZ, and WZ: collection and assembly of data. LZ, ZW, and JG: data analysis and interpretation. All authors: manuscript writing and final approval of manuscript.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.694988/full#supplementary-material

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Degree Centrality of a Brain Network Is Altered by Stereotype Threat: Evidences From a Resting-State Functional Magnetic Resonance Imaging Study

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Previous studies have found the effects of stereotype threat (ST) on cognitive processes, emotions, and motivations which could account for the underperformance in domain tasks. Efficient brain function does not require the function of different brain regions during specific tasks, but it does require the brain networks on which information is transported. Based on these, the effects of ST on the degree centrality under the resting state of brain regions related to these processes were investigated under math-related ST. The results showed that RSDC was decreased in the left hippocampus and left middle occipital gyrus (MOC), while RSDC was increased in the left precuneus, the right angular gyrus (AG), and the right superior parietal gyrus (SPG) under ST. Interestingly, we also found that the right-left anterior temporal lobe (ATL) and the right hippocampus were negatively correlated with manipulation check (MC) score in the ST group, while the right-left ATL and the right hippocampus were positively correlated with MC score in the control group. These results might reflect those individuals who attempted to inhibit the negative emotions induced by the negative stereotypes under ST conditions while increasing the self-relevant processes by retrieving episodic memory or autobiographical memory.

Keywords: stereotype threat, rest-state fMRI, degree centrality, functional network, stereotype

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INTRODUCTION

Stereotype threat (ST) refers to the feeling of threat which is induced when individuals are worried that their behavior might confirm a stereotype or stigmatize the social identity of their in-group (Schmader and Johns, 2003; Jamieson and Harkins, 2007; Wout et al., 2009). Based on this, it has been confirmed that the negative stereotypes about a social identity could add pressure or concern and lead to underperformance in domain tasks (Steele and Aronson, 1995; Steele, 1997). Although numerous studies show mechanisms of underperformance in domain tasks under ST (e.g., Martens et al., 2006; Wraga et al., 2007; Johns et al., 2008; Krendl et al., 2008), there are only two studies that attempted to uncover the neural mechanisms of ST by using functional magnetic resonance imaging (fMRI) (Wraga et al., 2007; Krendl et al., 2008). Thus, it is helpful to learn more about the

neural basis of ST by using the resting-state fMRI (RS-fMRI) to investigate the effects of ST on the degree centrality in this study.

It has been suggested that the negative stereotype could be threatened when it is self-relevant (Steele, 1997). According to the integrated process model of ST, ST first induces an imbalance among the concepts of in-group, the ability of domain tasks, and self, which also implies that ST must be self-relevant (Schmader et al., 2008; Liu et al., 2021). Thus, when the ability of domain tasks is threatened by ST information, it can lead to the processes of self-doubt and self-validating the stereotype (Steele and Aronson, 1995), where negative thinking (Cadinu et al., 2005) and negative emotions (Johns et al., 2008) are further generated. To reduce the detrimental effects of negative thinking and negative emotions on performance, individuals attempt to suppress them, which reduces the working memory capacity required by the performance of domain tasks (Schmader and Johns, 2003; Johns et al., 2008).

Considering the effects of ST on self-relevant processes, negative emotions, and working memory capacity, the brain function related to them might be influenced by ST. For example, it has been found that the brain regions related to social emotion [e.g., angular gyrus (AG), left parietal cortex, and prefrontal cortex] were more active when a domain task was performed under an ST condition (Krendl et al., 2008). Wraga et al. (2007) also found that the brain regions associated with emotional load (e.g., medial prefrontal cortex, anterior cingulate cortex, and amygdala) were activated when a domain task was performed under an ST condition. Moreover, Forbes and Leitner (2014) found that negative feedback to the performance of domain tasks elicited a larger P100 component when individuals were under an ST condition, confirming that the working memory capacity is easily taxed by ST information. Mangels et al. (2012) found that the negative feedback related to event-related potential components is influenced by ST, implying that individuals are prone to disengage from domain tasks influenced by negative emotions.

Efficient brain function does not require the functioning of different brain regions during specific tasks, but it does require information being transported between them (Van Den Heuvel and Hulshoff Pol, 2010). Although some brain regions have been confirmed to be associated with ST, the brain network being influenced by ST is not clear. RS-fMRI can use the blood-oxygen-level-dependent (BOLD) signal of spontaneous activations during low-frequency fluctuations (0.01–0.1 Hz) to depict brain networks (Lowe et al., 2000; Van Den Heuvel and Hulshoff Pol, 2010). RS-fMRI degree centrality (RSDC) is a graph theory-based network analysis of the number of edges connecting to a node or the node strength for a given node (a voxel) in a whole-brain network (Zuo et al., 2012; Li et al., 2016). It has been found that RSDC has test-retest reliability and high sensitivity (Zuo and Xing, 2014) and that it can find the hubs of brain networks and provide functional connectivity of the entire brain (Zhang et al., 2019).

In previous studies (e.g., Schmader and Johns, 2003; Johns et al., 2008; Schmader et al., 2008), the female math ST was widely used to study the ST effect and had common mechanisms with other ST to some extent. Thus, the current study aimed to investigate the effects of ST on RSDC under math ST. According to the results of ST studies (Martens et al., 2006; Wraga et al., 2007; Johns et al., 2008; Krendl et al., 2008), we speculated that the RSDC of brain regions related to the regulation of social emotions (e.g., the medial prefrontal cortex and anterior cingulate cortex) might be increased. Considering the roles of the hippocampus in the generation of stressful responses (Buss et al., 2007; McEwen and Gianaros, 2010; Tottenham and Sheridan, 2010), we hypothesized that the RSDC of the hippocampus might be decreased under ST, which might make individuals more prone to experience stress-based arousal. Except in this region, due to the self-relevant processes being increased by ST (Steele and Aronson, 1995), we thought that the RSDC of the brain regions related to self-memory should be increased. Therefore, we further speculated that the RSDC of the brain regions, such as the right posterior parietal regions (PPC), related to the retrieval of episodic memory or autobiographical memory might be increased (Cabeza, 2008; Cabeza et al., 2011).

TABLE 1 | The demographic information of Stereotype threat (ST) and control subjects.

	ST group	Control group	*T*-value
Mean age	20.40 ± 1.71	21.13 ± 1.84	−1.43
Sex	25 females	23 females	
Education	14.44 ± 1.26	14.87 ± 1.29	−1.17

METHODS

Subjects

Forty-eight female undergraduates (25 in the ST group and 23 in the control group), aged 18–26 years (mean age 20.75 ± 1.79 years), participated in the experiment (as shown in **Table 1**). All the subjects gave written informed consent, were right-handed, had no current or past neurological or psychiatric illness, and had a normal or corrected-to-normal vision.

Experimental Materials

ST and Control Materials

In the present study, math ST was induced by reading math ST material. This material was introduced to subjects with statements such as "women are bad at math across all cultures." To make the ST material more compelling, a table was provided which showed the percentage differences between men and women for a math ability test. In the control condition, the subjects were instructed to read a scientific investigation about two fictitious mountain peaks.

Math Problem Examples

Three math problems were used as examples in this study. There were three numbers (30, 26, 7) in each math problem. The subjects were asked to calculate whether the result of subtraction of the first and second numbers could be divided by the third number; for example, whether the result of "(30 – 26) ÷ 7 = ?" was an integer.

Manipulation Check

Previous studies suggested that self-threat in ST might result from concerns over the evaluation about themselves based on the negative stereotype of their ingroup. Thus, to assess the reliability of the ST manipulation, subjects were asked to rate how strongly they agreed with the statement "I am worried that the experimenters will conclude that women are bad at math based on my performance" on a 7-point scale (from strongly disagree to strongly agree).

ST and Control Material Verification

To verify whether the ST materials could induce ST, 112 female subjects (56 subjects each for ST and control groups) were selected from the Southwest University in China. First, the subjects were asked to read ST materials (ST group) or control materials (control group). Then, the subjects were asked to complete 20 math problems similar to the examples. The results showed that the mean accuracies of math problems were 0.589 ± 0.149 for the control group and 0.500 ± 0.137 for the ST group. The mean accuracy of math problem answers was lower for the ST group than for the control group [$t_{(110)} = 3.286$, $p = 0.001$].

Experimental Procedure

When the participants arrived individually at the magnetic resonance imaging (MRI) lab, a male experimenter greeted them and instructed them, and then they were led to the MRI scanner by a male scanning technician. When placed into the MRI scanner and prepared, the subject was allowed to adapt to the MRI scanner for ∼8 min. Subjects were asked to relax, keep their eyes open, and focus on the "+" that appeared at the center of the screen, and not to move their body or head. After the RS-fMRI scanning pre-test, the manipulation materials (ST or control materials) were presented, and the subjects were randomly assigned to the ST or control group based on the materials they read. Thereafter, a male experimenter told the subjects that they had about 8 min to prepare for the math aptitude test and presented the three examples of the math problem. The instructions for the post-test RS-fMRI scanning were the same as those used for the pre-test. Each RS-fMRI included 242 scans with 484 s in duration. When the RS-fMRI scanning was over, the male experimenter informed the subjects that there were 20 math problems to be completed and asked them to complete the MC inside the scanner within 3 min. When the MC was completed, the subjects were informed that the experiment was over.

MRI Image Acquisition and Pre-Processing

MRI Image Acquisition

The whole-brain RS-fMRI images were acquired from a Siemens 3T scanner (MAGENTOM Trio, a Tim system) with a gradient-echo echo-planar imaging sequence: echo time (TE) = 30 ms; repetition time (TR) = 2,000 ms; flip angle = 90°; slices = 32; slice thickness = 3.0 mm; slice gap = 1 mm; field of view (FOV) = 220 × 220 mm; resolution matrix = 64 × 64; in-plane resolution = 3.4 × 3.4 mm; interslice skip = 0.99 mm. For each subject, 242 functional images were acquired.

In addition, high-resolution T1-weighted anatomical images were acquired using a magnetization-prepared, rapid gradient echo sequence (TR = 1,900 ms; TE = 2.52 ms; inversion time = 900 ms; flip angle = 9°; resolution matrix = 256 × 256; slices = 176; thickness = 1.0 mm; voxel size = 1 × 1 × 1 mm).

Image Pre-Processing

The RS-fMRI images were pre-processed using statistical parametric mapping software (SPM8, http://www.fil.ion.ucl.ac.uk/spm) and a toolbox for Data Processing and Analysis for Brain Imaging (DPABI: http://rfmri.org/dpabi) in MATLAB 8.1.0 (http://cn.mathworks.com/). First, the DICOM data were converted to NIFTI images, and the first 10 images were discarded. Then, the remaining images were slice timed and realigned. A head motion correction was then performed to estimate and modify head movements. The various covariates, including white matter, cerebrospinal fluid, and the Friston 24-parameter, were regressed out of the data to reduce the potential impact of physiological artifacts. Then the anatomical images were co-registered to the mean functional image and were subsequently segmented. Thereafter, all the functional images were normalized to the Montreal Neurological Institute (MNI) space of 3 × 3 × 3 mm voxel sizes using the segmented data. The normalized images were spatially smoothed with a Gaussian kernel having a full width at half maximum (FWHM) of 8 mm. Finally, linear trends were removed, and the images were temporally band-pass filtered (0.01–0.08 Hz) to reduce low-frequency drift and high-frequency noise.

Degree Centrality Analysis

The Calculation of RSDC

The RSDC was calculated using DPABI. The algorithm for RSDC has been reported previously (Zuo et al., 2012) and can be briefly summarized as follows. First, the time series for each voxel was extracted from the pre-processed RS-fMRI data to calculate a correlation matrix using the temporal Pearson's correlation of the time series between certain voxels and others. Then, fully connected binary and weighted graphs were built with a threshold of correlation $r = 0.25$. In the binary graph, the value was 1 if the correlation between two voxels was larger than the threshold; otherwise, the value was 0. In the weighted graph, the value was the correlation if the correlation between two voxels was larger than the threshold; otherwise, the value was 0. According to the adjacency matrix of the graph, the RSDC was calculated for each voxel by the addition of the correlations of each voxel. Finally, the values in each voxel were transformed to z-values using the Fisher z-transformation to improve normality.

Mixed-Effect Analysis

After the RSDC z-values for the pre-test and post-test, RS-fMRIs of the two groups were calculated, we performed a whole-brain 2 (test: pre-test vs. post-test) × 2 (ST: ST group vs. control group) mixed-effect analysis for binary and weighted graphs. The statistical criterion was set at a Gaussian random field (GRF) corrected threshold ($p < 0.001$ at the voxel level, and $p < 0.05$ at the cluster level) for the main effect of the test, the main effect of ST, and the interaction effect between ST and test.

According to the results, the peak coordinate of each significant cluster was used to create a spherical region of interest (ROI) with an 8-mm radius, and the RSDC values of each ROI were extracted by using the "ROI Signal Extractor" of DPABI. To analyze the sample effect of the interaction effect, the analysis of covariance was used to compare the mean RSDC of each ROI in the post-test between ST and control groups, where the RSDC values in the pre-test were seen as covariables. Finally, the correlations between each ROI and MC score were analyzed by using Pearson's correlation, where the threshold was $p < 0.05$ with Bonferroni correction applied.

Interaction Between ST and MC Score Predicting RSDC

To further analyze the relationships between RSDC and MC score, the post-test RSDC values for ST and control groups were input to the SPM to analyze the interaction between the MC score and ST by setting the MC score as the covariate in the two-sample *t*-test of SPM 12. This method has been successfully employed in previous studies to analyze the interaction between variables and the index of structural and functional MRI (Takeuchi et al., 2013; Li et al., 2014, 2018; Wei et al., 2015). The interactions between ST and MC scores were assessed by using *t*-contrasts [(1, −1) or (−1, 1)], where the statistical inference was $p < 0.005$ at the voxel level with GRF-corrected $p < 0.05$ at the cluster level. Based on the significant results, the clusters that showed interactions were saved as masks, and their RSDC values were extracted by using the "ROI Signal Extractor" of DPABI. Finally, to analyze the modulating roles of ST on the relationships between the post-test RSDC of these regions and the MC score, Model 1 of PROCESS 3.0 (www.guilford.com/p/hayes3) was used.

RESULTS

Results of the MC

The results showed that the MC score for the ST group was 4.52 ± 1.58, while the MC score for the control group was 3.47 ± 1.31. The two-sample *t*-test analysis showed that the mean MC score for the ST group was significantly higher than that of the control group [$t_{(46)} = 2.47$, $p = 0.017$].

Results of RSDC Analysis

Mixed-Effect Analysis of the Binary Graph

The results of 2 (test: pre-test vs. post-test) × 2 (ST: ST group vs. control group) mixed-effect analysis for the binary graph showed that the main effect of the test was significant in the left hippocampus, middle cingulate gyrus (MCG), right cerebellum, and left precentral gyrus (PCG), while the interaction between the test and ST was significant in the left cerebellum anterior lobe, left hippocampus, left precuneus, and left MOC (as shown in **Figure 1**; **Table 2**).

For the brain regions that had a significant main effect of the test, the results showed that the mean RSDC *z*-value only in MCG was higher for the ST group relative to the control group [$F_{(1, 45)} = 4.883$, $p = 0.032$]. Of those brain regions that had significant interactions, the mean RSDC *z*-value in the left cerebellum was lower for the ST group relative to the control group [$F_{(1, 45)} = 8.484$, $p = 0.006$]; the mean RSDC *z*-value in the right superior parietal gyrus (SPG) was higher for the ST group relative to the control group [$F_{(1, 45)} = 8.453$, $p = 0.006$]; the mean RSDC *z*-value in the left precuneus was higher for the ST group relative to the control group [$F_{(1, 45)} = 8.426$, $p = 0.006$]; the mean RSDC *z*-value in the left MOG was higher for the ST group relative to the control group [$F_{(1, 45)} = 7.522$, $p = 0.009$]; the mean RSDC *z*-value in the right AG was higher for the ST group relative to the control group [$F_{(1, 45)} = 8.976$, $p = 0.004$]; and the mean RSDC *z*-value in the left hippocampus was lower for the ST group relative to the control group [$F_{(1, 45)} = 7.851$, $p = 0.007$]. However, the RSDC for these regions was not significantly correlated with the MC score (as shown in **Table 2**).

Mixed-Effect Analysis of the Weighted Graph

The results of whole-brain 2 (test: pre-test vs. post-test) × 2 (ST: ST group vs. control group) mixed-effect analysis for the weighted graph showed that the main effect of the test was significant in the left hippocampus, left MCG, right cerebellum, and left PCG, while the interaction between the test and ST was significant in the left cerebellum anterior lobe, left precuneus, left MCG, right SPG, and right AG (as shown in **Figure 2**; **Table 2**).

For the brain regions that had a significant main effect of the test, the results showed that the mean RSDC *z*-value only in MCG was higher for the ST group relative to the control group [$F_{(1,45)} = 4.854$, $p = 0.033$]. For the brain regions that had significant interactions, the mean RSDC *z*-value in the left cerebellum was lower for the ST group relative to the control group [$F_{(1,45)} = 4.228$, $p = 0.046$]; the mean RSDC *z*-value in the right SPG was higher for the ST group relative to the control group [$F_{(1,45)} = 7.594$, $p = 0.008$]; the mean RSDC *z*-value in the left precuneus was higher for the ST group relative to the control group [$F_{(1,45)} = 8.900$, $p = 0.005$]; the mean RSDC *z*-value in the left MOG was higher for the ST group relative to the control group [$F_{(1,45)} = 7.571$, $p = 0.009$]; and the mean RSDC *z*-value in AG was higher for the ST group relative to the control group [$F_{(1,45)} = 9.199$, $p = 0.004$]. However, the RSDC for these regions was not significantly correlated with the MC score (as shown in **Table 3**).

The Modulating Roles of ST in the Relationships Between RSDC and MC Score

The interaction between ST and MC score was significant in the right anterior temporal lobe (ATL) [peak in (51, −3, −24)] and the right hippocampus/amygdala [peak in (36, −12, −24)] for the binary graph, while only the right hippocampus/amygdala [peak in (36, −12, −24)] showed significant results for the weighted graph (as shown in **Figure 3**).

For the binary graph, the results showed that the interaction between ST and post-test RSDC of the right ATL was significant [$\Delta R^2 = 0.246$, $F_{(1,43)} = 17.743$, $p < 0.001$]. The sample slope test showed that the post-test RSDC for the ST group was negatively correlated with the MC score ($\beta = -0.548$, $t = -2.438$, $p = 0.019$), while the post-test RSDC for the ST group was positively correlated with the MC score ($\beta = 0.517$, $t = 3.234$, $p = 0.002$). The interaction between ST and post-test RSDC of the right hippocampus was significant [$\Delta R^2 = 0.300$, $F_{(1,43)} = 23.11$, $p < 0.001$]. The sample slope test showed that the post-test RSDC

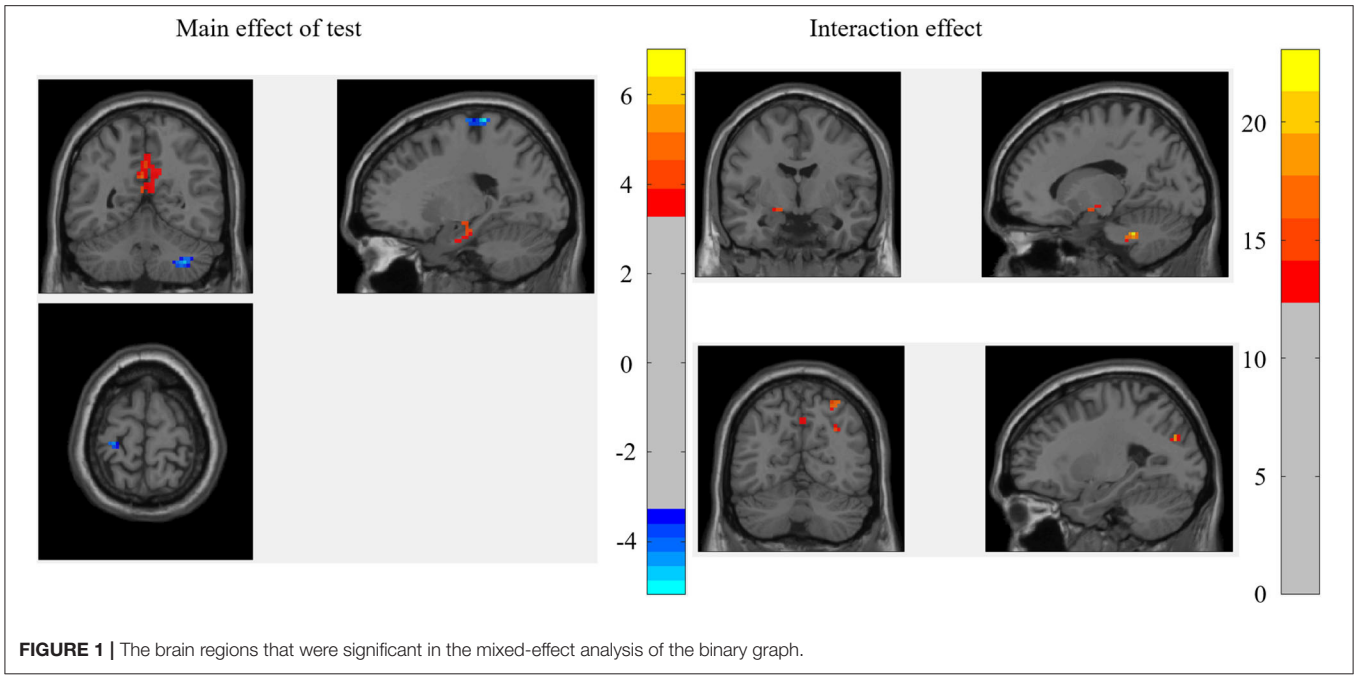

FIGURE 1 | The brain regions that were significant in the mixed-effect analysis of the binary graph.

TABLE 2 | The brain regions that were significant in the mixed-effect analysis of the binary graph.

Cluster size	Brain region	Cohen's f^2	F/T	Peak	Correlated with MC score	
(mm^3)	Labels		Value	(x, y, z)	ST	Control
Main effects of test						
7,047	Left hippocampus	1.073	$T = 7.03$	6, 0, −12	0.202	−0.005
3,996	Middle cingulate gyrus	0.541	$T = 4.99$	0, −45, 36	0.093	−0.026
1,755	Right cerebellum	0.492	$T = -3.28$	39, −54, −42	−0.033	−0.240
1,296	Left precentral gyrus	0.586	$T = -3.31$	−15, −18, 78	−0.002	−0.003
Main effects of ST						
No significant voxel was found						
Interaction						
513	Cerebellum	0.459	$F = 21.11$	−15, −42, −33	0.096	0.141
378	Right superior parietal gyrus	0.399	$F = 18.36$	24, −66, 57	−0.179	−0.226
324	Left precuneus	0.361	$F = 16.67$	−3, −66, 48	0.153	−0.082
297	Left middle occipital gyrus	0.414	$F = 19.08$	−27, −75, 27	0.018	−0.031
270	Right AG	0.489	$F = 22.51$	33, −60, 36	0.057	0.315
243	Left hippocampus	0.333	$F = 15.34$	−12, −12, −9	−0.021	0.466

of the right hippocampus was negatively correlated with the MC score in the ST group ($\beta = -0.416$, $t = -2.470$, $p = 0.018$), while the post-test RSDC of the hippocampus was positively correlated with the MC score in the control group ($\beta = 0.731$, $t = 3.907$, $p < 0.001$) see **Figure 4**.

For the weighted graph, the results showed that the interaction between ST and post-test RSDC of the right ATL was significant for the weighted graph [$\Delta R^2 = 0.239$, $F_{(1,43)} = 16.998$, $p < 0.001$]. The sample slope test showed that the post-test RSDC for the ST group was negatively correlated with the MC score ($\beta = -0.561$, $t = -2.446$, $p = 0.019$), while the post-test RSDC for the ST group was positively correlated with the MC score ($\beta = 0.501$, $t = 3.175$, $p = 0.003$). The interaction between ST and post-test RSDC of the right hippocampus was significant [$\Delta R^2 = 0.295$, $F_{(1,43)} = 22.50$, $p < 0.001$]. The sample slope test showed that the post-test RSDC of the right hippocampus was negatively correlated with the MC score in the ST group ($\beta = -0.458$, $t = -2.431$, $p = 0.019$), while the post-test RSDC of the hippocampus was positively correlated with the MC score in the control group ($\beta = 0.660$, $t = 3.535$, $p < 0.001$) see **Figure 4**.

DISCUSSION

In the present study, the effects of ST on the RSDC of brain networks were investigated using RS-fMRI under math ST conditions. The results showed that the RSDC decreased in the left MOG and the left hippocampus, while the RSDC increased

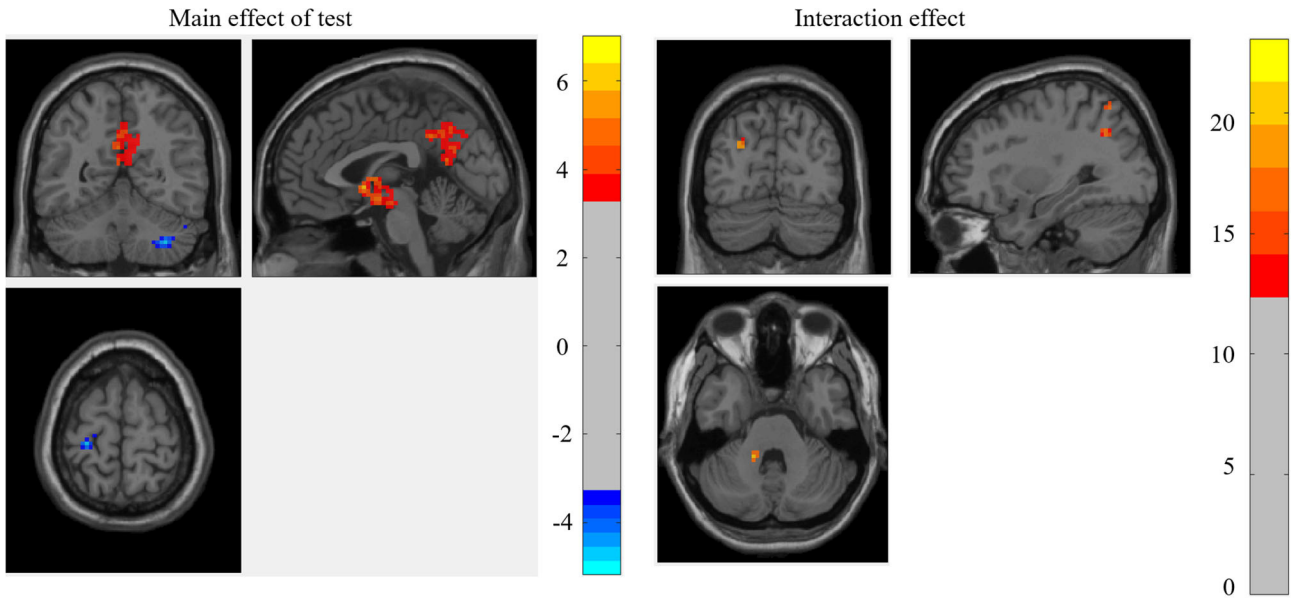

FIGURE 2 | The brain regions that were significant in the mixed-effect analysis of the weighted graph.

TABLE 3 | The brain regions that were significant in the mixed-effect analysis of the weighted graph.

Cluster size	Brain region	Cohen's f^2	F/T	Peak	Correlated with MC score	
(mm^3)	Labels		value	(x, y, z)	ST	Control
Main effect of test						
5,265	Left hippocampus	1.031	$T = 6.89$	6, 0, −12	0.195	−0.015
4,698	Left middle cingulate gyrus	0.547	$T = 5.02$	0, −45, 36	0.057	−0.034
1,890	Cerebellum	0.644	$T = -3.28$	48, −54, −33	−0.048	−0.243
1,647	Left precentral gyrus	0.618	$T = -3.30$	−15, −18, 78	0.008	0.009
Main effect of ST						
No significant voxel was found						
Interaction						
459	Cerebellum	0.447	$F = 20.57$	−15, −42, −33	0.101	0.134
297	Left middle occipatal gyrus	0.421	$F = 19.39$	−27, −75, 27	0.012	−0.027
297	Left precuneus	0.371	$F = 17.06$	−3, −66, 48	0.128	−0.039
297	Right superior parietal gyrus	0.359	$F = 16.54$	24, −66, 54	−0.132	−0.221
243	Right AG	0.456	$F = 22.51$	33, −60, 36	0.057	0.290

in the right MCG, right SPG, right AG, and left precuneus. Furthermore, the results also showed that the right ATL and right hippocampus were negatively correlated with the MC score in the ST group, while the right ATL and the right hippocampus were positively correlated with the MC score in the control group.

It has been found that brain regions in the posteromedial cortex, such as the precuneus and posterior cingulate cortex (PCC), are the hubs of the structural and functional networks of the brain (Hagmann et al., 2008), which means that these regions are highly connected to cortical and subcortical networks (Hagmann et al., 2008; Leech et al., 2012). These characteristics are involved in broad mental processing, such as episodic memory (autobiographical memory), mentalizing (Muscatell et al., 2012), self-referential processing, or self-reflection (Northoff and Bermpohl, 2004; van der Meer et al., 2010), and they allow the brain to acquire information from functionally distinct brain networks easily (Leech et al., 2012). Moreover, the left precuneus is a part of the default mode network (DMN) and plays an important role in self-generated thoughts (Andrews-Hanna et al., 2014; Axelrod et al., 2015). Therefore, we speculated that the increased RSDC in the left precuneus and MCG might reflect that some self-relevant thoughts are generated by retrieving autobiographical memory or episodic memory.

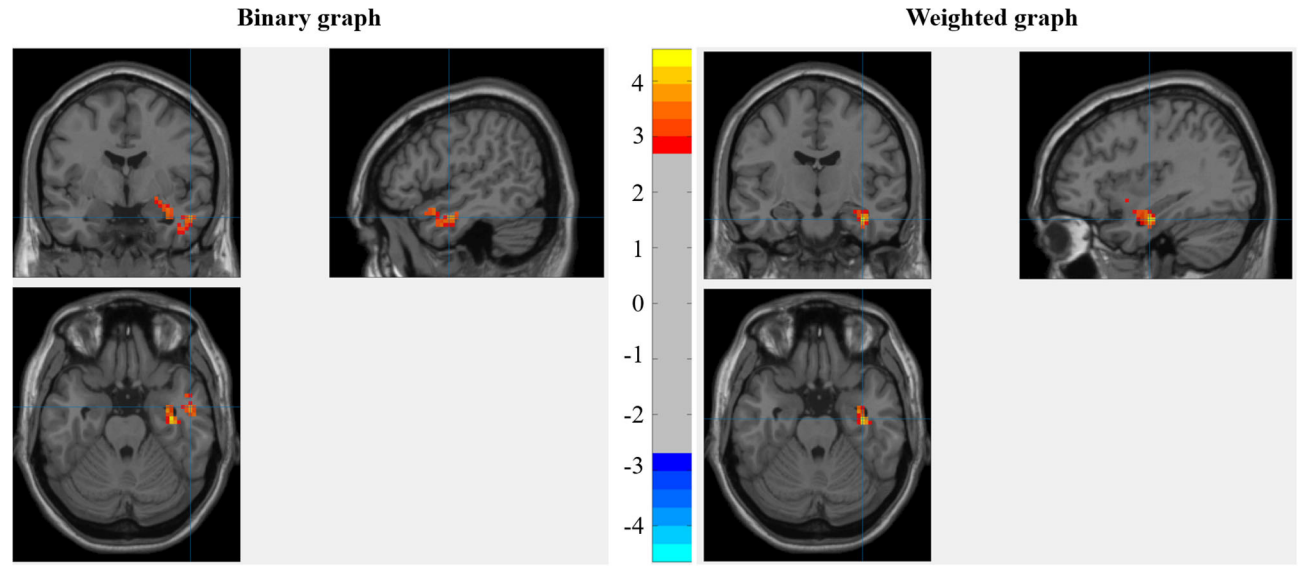

FIGURE 3 | The interaction between stereotype threat (ST) and manipulation check (MC) score when predicting the degree centrality under the resting state (RSDC).

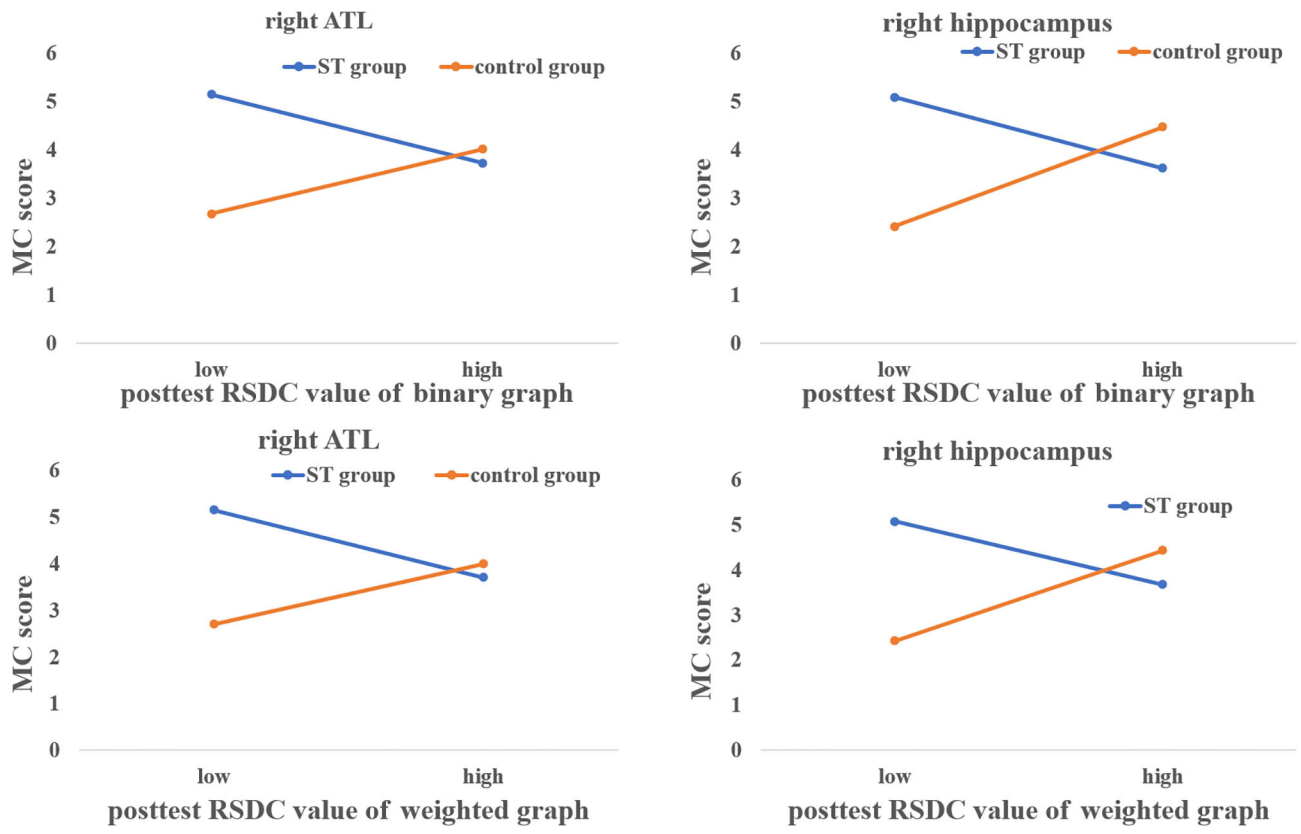

FIGURE 4 | The modulating roles of ST on the relationships between RSDC and MC score.

The self-relevant processes under ST could also be reflected by the increased RSDC in the PPC. Previous studies suggested that the PPC can be divided into the dorsal parietal cortex (DPC) and ventral parietal cortex (VPC), where the DPC includes the intraparietal sulcus and SPG, and the VPC includes the supramarginal and angular gyri (Cabeza, 2008; Cabeza et al.,

2011). Although both VPC and DPC are involved in the retrieval of autobiographical memory or episodic memory, the DPC is mainly involved in the top-down attention of retrieving these memories, and the VPC is mainly related to the bottom-up attention of these memories that are activated automatically (Cabeza, 2008; Cabeza et al., 2011; Wu et al., 2015). Moreover, the PPC is also located in the DMN and plays an important role in self-generated thoughts (Andrews-Hanna et al., 2014; Axelrod et al., 2015). Therefore, the increased RSDC in PPC for the ST group might further reflect that the self-relevant processes were induced by ST.

It has been suggested that ST increases stress-based arousal, such as increasing the activation of the sympathetic nervous system (Murphy et al., 2007), blood pressure (Blascovich et al., 2001), and cardiovascular responses (Mendes et al., 2002). Results from both animals and humans confirm that the experience of stress has significant negative effects on the hippocampus (Buss et al., 2007; McEwen and Gianaros, 2010; Tottenham and Sheridan, 2010), where glucocorticoids and mineralocorticoids are released to regulate the hypothalamic-pituitary-adrenal (HPA) axis on which physiological processes depend (Henry et al., 1994; Kudielka et al., 2004). The hippocampus is an important brain region for the regulation of stress hormones (Kim and Diamond, 2002; Glover et al., 2010), such as inhibiting the HPA axis through glucocorticoid-mediated negative feedback to terminate the stress response (Sapolsky, 1992; McEwen and Sapolsky, 1995). According to the results, the RSDC of the left hippocampus was decreased, and the RSDC of the right hippocampus was negatively correlated with the MC score under the ST condition. These results might reflect that the importance of the hippocampus in the brain networks was decreased by the ST condition, which might make individuals prone to exhibit stress-based arousal mentioned earlier.

It has been found that the role of the ATL was related to linking person-specific memories to representations of faces at the perception level for face processing (Olson et al., 2007) and is associated with the processes of comprehending the mind of others based on personal memories (Moriguchi et al., 2006). In addition, the ATL has an important role in social concepts (Olson et al., 2013). For example, previous studies have shown that stereotypes (a social concept) are represented by the ATL, which might play an important role in linking certain types of people to specific personality or behavioral traits (Olson et al., 2013). According to the results, the RSDC of the right ATL was negatively correlated to the MC score in the ST group, while the RSDC of the right ATL was positively correlated to the MC score in the control group. These findings reflect that the relative importance of the brain regions related to social concepts is decreased under ST, especially for more threatened individuals. It is dangerous to increase the self-relevant processes related to ST and at the same time decrease the functions of social concepts. Doing so might make individuals prone to be influenced by their stigmatized social identity and discount other beneficial social identities. Consistent with this perspective, a previous study found that learning other beneficial social identities can decrease the effects of ST (Rydell et al., 2009).

CONCLUSION

We detected the effects of ST on brain network degree centrality by directly comparing the RSDC between the ST and control groups. These findings expand the knowledge of the neural basis of ST. Specifically, the results suggest that ST decreases the importance of brain regions related to social concepts and stress regulation in the whole brain networks and, at the same time, increases the importance of brain regions associated with self-relevant processes. We acknowledge several limitations of the study. First, the performance of the math problem was not measured in an RS-fMRI study, and we did not confirm whether the altered RSDCs were related to underperformance under ST. Second, Steele and Aronson (1995) found that ST could lead to some self-concerning processes, such as self-doubts, self-validating the stereotype, and stereotype avoidance. Although we speculate that the altered RSDCs might be related to these mental processes, we could not provide direct evidence for them because behavior related to these processes was not measured. Third, due to this evidence being exclusively from female math ST, future studies should verify whether these results generalize to other STs (e.g., racial ST or ST related to social status). Therefore, we suggest that a sophisticated experiment integrating behavioral, task, and RS-fMRI may be required to reveal the detailed mechanism of ST.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Brain Imaging Center Institutional Review Board of Southwest China University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

XW and YZ designed the experiment and wrote this manuscript. Both authors contributed to the article and approved the submitted version.

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Can Sexual Appeal, Beauty, or Virtue Increase the Opportunity for a Woman to Be Selected as a Spouse? The Mediating Role of Human Uniqueness

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High mating value is believed to correspond with high mating opportunities. On that premise, this study explores three cues that are linked to women of high long-term mating value, namely a "beautiful" facial appearance, "sexually attractive" body shape, and "virtuous" behavior. With exclusive attention focused on the above cues, this study examines what kind of human attributes would make a contribution to women's mating opportunities. The results reveal that both "beautiful" women and "virtuous" women were assessed (in this study) as having greater mating opportunities than "sexually attractive" women. In regard to the human attributes, only the "beautiful" woman was assessed as having high levels of human uniqueness and human nature. Meanwhile, "virtuous" women were assessed as having higher levels of human uniqueness but lower levels of human nature. In contrast, "sexually attractive" women were assessed as having lower levels of human uniqueness but higher levels of human nature. In addition, the results of a mediation analysis show that the trait of human uniqueness, and not human nature, was the mediator between the three types of women and women's mating opportunities. This finding means that, when women have higher levels of human uniqueness, they can acquire more mating opportunities. These findings contribute an improved understanding to why and how "beauty" or "virtue" increases the opportunity for woman to be selected as a spouse.

Keywords: women stereotypes, human uniqueness, human nature, mating opportunity, mating values

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INTRODUCTION

In human society, mate selection is an important prerequisite for reproduction, providing the first step for individuals who want to enter into marriage and establish families. In the process of choosing a spouse, individuals tend to have certain criteria that they use to define a high-quality mate or a spouse of high mating value. Men focus on three issues: (1) whether the

spouse has high reproductive value; (2) whether the spouse's children have a paternity relationship with the man, and (3) whether the spouse can cooperate with the man to co-nurture their offspring (Buss and Schmitt, 2019). The first issue is associated with women's physical attractiveness; the second and the third issues are associated with women's moral qualities.

Female reproductive value is inferred by examining external physical cues (Garza et al., 2016). Women of higher reproductive value show a stronger attractiveness in terms of facial features and having sexual figures (Andrews et al., 2017). These facial features usually include facial adiposity, plump lips, a small chin, thin jaws, and high cheekbones, all of which make the face look attractive (Karremans et al., 2010). Sexual figures are often taken to mean a slender waist, a low waist-to-hip ratio, firm breasts, and a relatively low body mass index (BMI); these features are considered to be reliable indicators of body attractiveness in women (Kościński, 2013; Sugiyama, 2015).

Scientific studies have confirmed that women of high reproductive value usually have the above facial features and sexual figure characteristics. On the one hand, individual differences in facial attractiveness may reflect women's fertility differences (Jokela, 2009), and even differences in lifespan (Conroy-Beam and Buss, 2019). Studies have found that, at different stages of the menstrual cycle, a woman's facial attractiveness can change. People's evaluation of the same woman's facial attractiveness is higher during her ovulation stage than her luteal phase (Roberts et al., 2004). On the other hand, underweight women (BMI < 18.5) or overweight women (BMI > 25) are at a higher risk of developing serious diseases such as ovulatory dysfunction (Green et al., 1988) and cardiovascular diseases (Kopelman, 2000). Nonetheless, different subjects and methodological studies have shown that men perceive the facial attractiveness and body shape of potential mates to be important (Buss, 1985; Townsend and Levy, 1990; Bleske-Rechek et al., 2014; Morgan and Kisley, 2014). Furthermore, men are apparently more greatly concerned with women's body shapes when seeking one-time sexual encounters. However, men pay more attention to women's facial attractiveness when considering the value of a long-term mate (Morgan and Kisley, 2014).

A woman's abilities to run a family and raise offspring are inferred by examining her moral qualities and personality traits (Miller, 2007; Buss, 2011). In terms of moral qualities, men are more concerned with female sexual loyalty and controllability (Buss and Schmitt, 1993). Such traits can increase the probability of a biological genetic relationship between men and their future generations (Gil-Burmann et al., 2002). In terms of personality traits, men value characteristics such as kindness, reliability, and congeniality (Apostolou, 2015), which are considered to be essential to creating a warm and healthy family life atmosphere.

A survey about marriage and love was conducted in China. The results revealed that a female's physical (e.g., having a small chin), behavioral (e.g., chastity), and personality traits (e.g., being honest, kind, faithful, and sexually modest) are the values most favored by men, largely because having women with these characteristics as spouses or partners would relieve the men of any paternity uncertainty (Chang et al., 2010). In addition, traditional Chinese cultures provide guidelines for women with regard to being "good wives and mothers." These traditions require that a woman should be loyal to her husband and take care of every family member, including their parents-in-law. The woman should also deal with family affairs diligently and ensure the children are educated (Chang et al., 2010; Schlomer et al., 2011). Men's potential long-term mates should have high attractiveness in terms of facial appearance, good personalities, and the ability to manage housework. With those traits, women can give their husbands enough care and support in the couple's future married life (Yan et al., 2018). Since the implementation of the policy of economic reform and opening-up in China, women's social status has significantly improved, with increased education and independence. This, then, has caused an improvement in terms of women's knowledge and ability, and more women have achieved economic independence. As a result, women's abilities to support their families have been increasingly enhanced, and those abilities are becoming increasingly valued by men. Men also prefer mates with such attributes as hard work and generosity, because those attributes also signal a woman's potential ability to support her family (Hao, 2011; Lu et al., 2015).

High mating values are believed to correspond with high mating opportunities. Therefore, to increase their mating opportunities, women adjust their behaviors to accommodate men's abovementioned preferences. For example, women like to put on makeup when dating, because they believe makeup makes them look healthier (Bielfeldt et al., 2013; Jones et al., 2016) by reducing the signs of age and increasing facial attractiveness (Porcheron et al., 2013; Jones et al., 2015). Women will spend more money on beauty products to increase their attractiveness despite economic difficulties. This behavior is viewed as an instinctive response to the intensified competition for spouses in difficult times (Hill et al., 2012). Furthermore, for reasons of mating motivation, women are willing to help others in public (Griskevicius et al., 2007). In other words, women want to be seen in public to be kind, helpful, moral, and generous as this type of behavior could be admired by members of the opposite sex, thus enhancing the women's mating value. Therefore, women are very familiar with men's mate preferences. In fact, women have similar views regarding a female's mating value as men.

Although having a sexually attractive body (e.g., a slender waist and firm breasts), beautiful facial appearance (e.g., plump lips and a small chin), and the qualities associated with being "good wives and mothers" (e.g., kindness, diligence, and love) are the important mating values, focusing exclusively on such mating values could cause a cognitive bias against women, incurring certain negative stereotypes (Cikara et al., 2011). For example, women in hot clothes attract others' attention to their sexually appealing bodies (e.g., firm breasts and warped fruity buttocks). However, dressing this way could also incur being labeled with negative stereotypes such as having lower moral value (e.g., engage in extramarital affairs) and lesser abilities (Loughnan et al., 2010). Also, women with beautiful facial appearance, or those who are admired for their looks,

could equally incur being labeled with such negative stereotypes as lacking vitality and warmth (Heflick and Goldenberg, 2009) or having a lesser ability to experience pain (Philippe et al., 2018). How, exactly, can these stereotypes be incurred? Haslam's two-dimensional model of humanness may shed some light.

According to Haslam's two-dimensional model, human uniqueness and human nature constitute the two senses (or dimensions) of humanness (Haslam, 2006). Human uniqueness literally means unique human characteristics. These characteristics, in turn, such as morality (e.g., being well-educated, having secondary emotion such as regret and grateful), maturity (e.g., being socialized, civilized, literate), and rationality (e.g., self-control, behavior driven by reason) represent the cultural layer of humanness. These are the characteristics that separate humans from animals, and such features are acquired through cultivation. Human nature, as the second dimension, is comprised of the innate and essential part of one's humanness. The features are defined by vitality, emotions (e.g., happiness, anger, fear, and other primary emotions), cognitive openness (e.g., curiosity and flexibility), and agency (e.g., taking the initiative to do things on one's own). These are the features that separate humans from objects or automata; such characteristics should also be the same in every person, regardless of the individual's cultural background (Haslam, 2006; Haslam and Loughnan, 2014).

The stereotypes that stem from focusing solely on women's sexually appealing bodies lead to men viewing women as individuals with a lesser degree of humanness. This view also has detrimental effects on the treatment of women, including an increase in and the facilitation of aggression (Haslam, 2006; Haslam and Loughnan, 2014), rape proclivity (Cikara et al., 2011; Rudman and Mescher, 2012), and deception (Rudman and Mescher, 2012; Xiao et al., 2017). Moreover, recent findings show that the stereotypes that stem from focusing solely on beautiful facial appearance are also correlated with the perception that a woman is less able to feel pain. Such a perception could facilitate aggression toward women (Morris et al., 2018). Therefore, examining whether these negative stereotypes can also influence women's mating opportunities is very worthwhile.

To date, some evidence has linked the stereotypes of "beautiful" women and "sexually attractive" women with devalued humanness, but more empirical studies are still required, in order to validate those findings. In addition, the relationships between humanness and women's mating opportunities have not been tested. Furthermore, whether the two independent dimensions of humanness – human uniqueness and human nature –can make similar contributions to mating opportunities is still under exploration. It is important to note that no direct research exists that explores what kind of humanness can be derived from the stereotypes of "virtuous" personalities represented by "good wives and mothers." However, "virtuous" personalities have traditionally been considered to be important in Chinese culture when judging women's mating value. This study examines the effects of stereotypes on the perceived women's mating opportunities by manipulating the three kinds of stereotypes represented by "sexually attractive" women, "beautiful" women, and "virtuous" women, respectively. More specifically, three kinds of stereotypes were induced by attracting participants to focus on the features of a sexually appealing body, beautiful facial appearance, and "virtuous" behavior. Checking the effects of human uniqueness and human nature is important if one is to understand the relationships of perceived women's mating opportunities and their stereotypes. As mentioned above, women may have the same consciousness as men when judging another female's mating value, and as there is no evidence indicating any gender difference when judging the humanness of women, this study will further testify to the gender effect in these aspects.

MATERIALS AND METHODS

Participants

A power analysis, conducted in G*power (Version 3.1.9.2; Faul et al., 2007), indicated that a minimum total sample size of $N = 211$ was required to achieve sufficient power ($1-\beta = 0.80$) with a medium effect size of $f = 0.25$. A total of 251 undergraduate participants were recruited through a psychological health education course; all participated in this study through the Wenjuanxing questionnaire platform,[1] and everyone who participated was paid five CNY. Three questionnaires were excluded from the final results, because three individuals reported their sexual orientation as being homosexual or bisexual. Another eight questionnaires were excluded because they failed to pass the attention test, which stated, "This question is an attention test, please choose number 2." Those eight respondents did not choose the number 2. In the "sexually attractive" category, the sample consisted of 39 males ($M_{age} = 18.79$ years, $SD_{age} = 0.83$) and 36 females ($M_{age} = 21.83$ years, $SD_{age} = 17.50$). In the "beautiful" category, the sample consisted of 37 males ($M_{age} = 18.95$ years, $SD_{age} = 1.60$) and 42 females ($M_{age} = 19.00$ years, $SD_{age} = 2.34$). In the "virtuous" category, the sample consisted of 44 males ($M_{age} = 18.89$ years, $SD_{age} = 0.92$) and 42 females ($M_{age} = 18.64$ years, $SD_{age} = 1.03$). The three categories had no differences in gender, χ^2 (1, $N = 240$) = 0.48, $p = 0.79$. No main effect of gender was noted on age, $F(1, 234) = 1.13$, $p = 0.289$, $\eta_P^2 = 0.005$. No main effect of categories was noted on age, $F(2, 234) = 1.16$, $p = 0.317$, $\eta_P^2 = 0.010$, and no interaction of gender and category was noted on age, $F(2, 234) = 1.34$, $p = 0.263$, $\eta_P^2 = 0.011$. This study was approved by the Research Ethics Committee of Hunan Normal University. Informed consent was obtained from all the participants who involved in this study.

Materials

Image Prime

Participants were asked to perform an impression task, and they were presented with one profile consisting of four images. Three profiles were used in total, depicting "sexually attractive" women, "beautiful" women, and "virtuous" women, respectively. In the "sexually attractive" category, the woman wears a sexy black mini skirt with bare skin above her

[1]https://www.wjx.cn/

chest and below her thighs. Under illumination, she swayed her body, highlighting her firm breasts and hips. In the "beautiful" category, the woman dressed fashionably but in non-revealing clothing; her face appeared glamorous and polished. In the "virtuous" category, the woman wore simple clothes to do some things, such as making pottery pots, taking photographs, choosing books, and hugging dolls. These actions were intended to show the characteristics of ingenuity, warmth, and an orchid heart. This study used three different women for each category. The priming pictures are available at https://doi.org/10.17605/osf.io/qr7jv.

To determine the appropriateness of the images, pilot testing was conducted on the Wenjuanxing questionnaire platform ($n = 95$). In all, 27 undergraduate participants (21 females, $M_{age} = 24.52$ years, $SD_{age} = 7.20$ and 6 males, $M_{age} = 22.67$ years, $SD_{age} = 2.07$) viewed the images of the sexually attractive woman, 32 undergraduate participants (17 females, $M_{age} = 18.35$ years, $SD_{age} = 1.50$ and 15 males, $M_{age} = 20.13$ years, $SD_{age} = 2.17$) viewed the images of the beautiful woman, and 36 undergraduate participants (18 females, $M_{age} = 18.06$ years, $SD_{age} = 0.54$ and 18 males, $M_{age} = 18.67$ years, $SD_{age} = 2.79$) viewed the images of the virtuous woman. Then, participants were asked to respond to questions that were designed to assess the perceived sexual attractiveness ("How sexually attractive is this woman?"), the value of a beautiful face ("How beautiful is this woman?"), and the value of internal attributes ("How important is this woman's virtuous personality?"). Each question was rated from 1, for not at all to 7, for very much. There was a significant effect of the prime on perceived sexual attractiveness: $F(2, 92) = 9.72$, $p < 0.001$, $\eta_P^2 = 0.18$. The woman in the sexually attractive category was rated as more sexual than both the beautiful woman and the virtuous woman ($p_s < 0.004$); the latter two did not differ from one another in their ratings ($p = 0.080$). A significant effect of the prime on perceived face value was also noted: $F(2, 92) = 5.47$, $p = 0.006$, $\eta_P^2 = 0.11$. The beautiful woman was assigned a higher value for her face than both the sexually attractive woman and the virtuous woman ($p_s < 0.032$); the latter two did not differ from one another in their scores ($p = 0.62$). Furthermore, a significant effect of the prime on perceptions of internal attributes was noted: $F(2, 92) = 20.31$, $p < 0.001$, $\eta_P^2 = 0.31$. The virtuous woman was valued more highly for her virtuous trait than either the beautiful woman or the sexually attractive woman ($p_s < 0.021$). Meanwhile, the beautiful woman was rated as having a higher value for her virtuous trait than the sexually attractive woman ($p < 0.001$). In addition, participant gender did not interact with the prime to affect results for any outcome ($p_s > 0.48$).

Humanness

Participants were assigned to complete both the human uniqueness (i.e., humble, trustworthy, analytical, helpful, sincere, polite, civilized, conservative, thorough, competent, tolerant, and refined) and human nature subscales (i.e., fun-loving, sociable, active, passionate, emotional, talkative, friendly, imaginative, ambitious, artistic, curious, and impulsive). Participants were asked to determine the extent of the 24 typical traits of the woman in the profile (from 1, meaning very atypical, to 5, meaning very typical). The 24 traits were adopted from previous research (Haslam et al., 2005; Heflick et al., 2011; Noël et al., 2021), and participants were asked to rank the women in terms of each of the traits. Composite scales were constructed by averaging target trait ratings on the items which were identified as representing the domains of human uniqueness ($\alpha = 0.94$) and human nature ($\alpha = 0.88$).

Possibility of Being Married

Participants were asked to indicate the possibility of each of the three women stereotypes being chosen as a wife. Responses were recorded on a 7-point scale, ranging from 1 (no possibility of being chosen) to 7 (certain to be chosen).

Demographics

Participants completed a short demographic questionnaire to determine their age, gender, and sexual orientation.

RESULTS

Humanness Ratings

A repeated-measures ANOVA was conducted, with 2 (participant gender: female vs. male) × 3 (stereotypes: "sexually attractive" woman vs. "beautiful" woman vs. "virtuous" woman) × 2 (humanness dimension: human uniqueness vs. human nature). Humanness is a within-subjects variable, while participant gender and the stereotypes are between-subjects variables. The ratings of human uniqueness and human nature were standardized, so that the differences between the two could be compared. The results show the main effect of humanness is not as significant ($p = 0.55$) as the main effect of participant gender ($p = 0.92$). On the contrary, the stereotypes had the significant main effect, $F(2,234) = 7.41$, $p = 0.001$, $\eta_P^2 = 0.60$. The pairwise comparison also revealed that the "sexually attractive" woman ($M = -0.30$, $SD = 0.83$) was seen to have lower humanness than the "beautiful" woman ($M = 0.12$, $SD = 0.84$), $p = 0.006$. The "sexually attractive" woman was also seen to have lower humanness than the "virtuous" woman ($M = 0.16$, $SD = 0.83$), $p = 0.001$, but no difference was found between the "beautiful" woman and the "virtuous" woman ($p = 1.00$). The interaction effect between humanness and participant gender was also not significant ($p = 0.63$).Interestingly, a significant interaction effect between humanness and stereotypes was observed: $F(2,234) = 50.93$, $p < 0.001$, $\eta_P^2 = 0.30$. A follow-up simple effects analysis showed the following: The human nature rating was significantly higher than the human uniqueness rating in the "sexually attractive" woman image prime conditions: $F(1, 234) = 61.98$, $p < 0.001$, $\eta_P^2 = 0.21$. However, the human nature rating was significantly lower than the human uniqueness rating in the "virtuous" woman image prime conditions: $F(1,234) = 38.68$, $p < 0.001$, $\eta_P^2 = 0.14$. Furthermore, no significant difference exists between the human nature rating and the human uniqueness rating in the "beautiful" woman image prime conditions: $p = 0.28$. In addition, the interaction effect between humanness, stereotypes, and participant gender was not observed, $p = 0.48$ (for more details, see **Table 1**).

TABLE 1 | Descriptive statistics of humanness and the possibility of being married M(SD).

Stereotypes	Human uniqueness				Human nature				Possibility of being married			
	Male	*Female*	*Total*	*P(M-F)*	*Male*	*Female*	*Total*	*P(M-F)*	*Male*	*Female*	*Total*	*P(M-F)*
"Sexually attractive" woman	−0.52 (0.99)	−0.86 (1.09)	−0.69 (0.10)	0.097	0.20 (0.72)	−0.033 (1.35)	0.085 (0.12)	0.31	3.74 (1.57)	4.11 (1.72)	3.92 (1.64)	0.25
"Beautiful"woman	0.20 (0.77)	0.14 (0.72)	0.17 (0.098)	0.76	0.21 (0.76)	−0.081 (0.98)	0.064 (0.11)	0.19	4.62 (1.26)	4.57 (1.35)	4.59 (1.30)	0.87
"Virtuous" woman	0.23 (1.00)	0.67 (0.56)	0.45 (0.094)	0.019*	−0.33 (1.23)	0.082 (0.73)	−0.12 (0.11)	0.056	4.00 (1.38)	5.10 (0.96)	4.53 (1.31)	< 0.001***

*M-F refers to the gender difference comparison; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.*

Ratings of Possibility of Being Married

To test the differences in the possibility of women being married within each category, an ANOVA was conducted, using participant gender (female and male) and the three stereotypes ("sexually attractive" woman, "beautiful" woman, and "virtuous" woman). In this study, the main effect of gender is significant: $F(1, 234) = 6.92$, $p = 0.009$, $\eta_P^2 = 0.029$. Females ($M = 4.59$, $SD = 1.42$) rated higher than males ($M = 4.12$, $SD = 1.42$) when considering the opportunities that women have to be married. The main effect of stereotypes is also significant: $F(2, 234) = 5.60$, $p = 0.004$, $\eta_P^2 = 0.046$. The "sexually attractive" woman received lower rating scores than the "beautiful" woman ($p = 0.003$); the "sexually attractive" woman also rated lower than the "virtuous" woman when considering the opportunities that women have to be married ($p = 0.005$). However, no significant difference was noted between the "beautiful" woman and the "virtuous" woman ($p = 0.82$). The interaction between gender and stereotypes was significant: $F(2, 234) = 3.63$, $p = 0.028$, $\eta_P^2 = 0.030$. For males, the "beautiful" woman was rated as having a better chance of being married than the "sexually attractive" woman: $p = 0.006$. The "beautiful" woman was also rated as having a better chance of being married than the "virtuous" woman: $p = 0.045$. However, no significant difference was noted between the "sexually attractive" woman and the "virtuous" woman, $p = 0.40$. For females, the "virtuous" woman was rated as having a better chance of being married than the "sexually attractive" woman: $p = 0.002$. No difference was noted between the "virtuous" woman and the "beautiful" woman: $p = 0.084$. Also, no difference was found between the "sexually attractive" woman and the "beautiful" woman: $p = 0.14$. These findings indicate that male participants rated "pretty" women as having a better chance of being married, while women tend to believe that men will be more likely to choose "virtuous" women as partners (for more details, see **Table 1**).

Mediation Analysis

To test whether the various ways of categorizing women could lead to different impacts on their marriage opportunities (based on humanness ratings), a mediation analysis was conducted through a bootstrapping approach. Effects were derived from 5,000 bias-corrected bootstrap samples, with 95% CI. The image prime involved three categories (the "sexually attractive" woman, the "beautiful" woman, and the "virtuous" woman) and was dummy coded, with the "virtuous" woman category as the reference category (D1: 0 = "virtuous" woman, 1 = "sexually attractive" woman; D2: 0 = "virtuous" woman, 1 = beautiful woman). The model assesses the effect of one dummy-coded variable by controlling for the other. The human uniqueness and human nature trait composites were included as mediators operating in parallel. The hypothesized model fit the data well: $\chi^2/df = 32.60$, CFI = 1.000, TLI = 1.000, RMSEA = 0.000.

Direct Effects

In the first stage of the model, the effect of the three kinds of stereotypes on humanness outcomes was examined. The "beautiful" woman was perceived as having fewer human

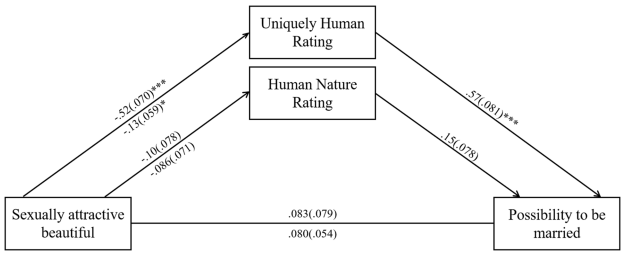

FIGURE 1 | Path estimates for the mediation effect of the "sexually attractive" woman and "beautiful" woman image prime on the possibility of being married through human nature and uniquely human rantings. For paths at the first stage of the model, values above the line reflect estimates for the "sexually attractive" woman image, relative to the control. Values below the line reflect estimates for the "beautiful" woman image, relative to the control (coded 0 = virtuous woman; 1 = comparison). Also, $^{*}p < 0.05$; $^{**}p < 0.01$; and $^{***}p < 0.001$.

uniqueness traits than either the "virtuous" woman [$b = -0.13$, $SE = 0.059$, $p = 0.027$, CI $(-0.24, -0.009)$] or the "sexually attractive" woman [$b = -0.52$, $SE = 0.070$, $p < 0.001$, CI $(-0.65, -0.38)$]. Conversely, the "beautiful" woman did not receive significantly higher scores than the "virtuous" woman for human nature traits ($p = 0.22$). The "sexually attractive" woman was also not rated significantly higher than the "virtuous" woman on human nature traits ($p = 0.20$).

The direct effect of the stereotypes on the possibility of being married was not significant for the "beautiful" woman category ($p = 0.14$). This finding indicates that "beautiful" women are considered to be as likely as "virtuous" women to be married. When the "sexually attractive" woman is compared with the "virtuous" woman, the effect on the possibility of being married is not significant ($p = 0.29$). This finding suggests that the "sexually attractive" woman was not perceived as being less likely than the "virtuous" woman to be married.

Indirect Effects

Based on the participants' perceptions of human uniqueness, the relative indirect (mediation) effect of women's stereotypes on the possibility of being married was significant for both the "beautiful" woman [effect = −0.073, $SE = 0.036$, CI $(-0.15, -0.01)$] and the "sexually attractive" woman [effect = −0.30, $SE = 0.062$, CI $(-0.42, -0.19)$]. Compared to the "virtuous" woman, the "sexually attractive" woman and the "beautiful" woman were both attributed fewer human uniqueness traits; this reflects a lower possibility that these women would be selected for marriage. In addition, the relative indirect effect of human nature ratings on the possibility of being married was not significant for either the "sexually attractive" woman or the "beautiful" woman, compared to the "virtuous" woman. **Figure 1** presents the full path model; **Table 2** displays the estimates of the relative indirect effects.

Additional analyses were conducted to determine whether participant gender moderated these effects. No direct effects of gender on the outcome were noted ($p_s > 0.072$).

TABLE 2 | Relative indirect effects.

			95% CI	
Mediator	**Effect**	**SE**	**LL**	**UL**
Uniquely human rating				
Sexually attractive vs. virtuous	−0.30	0.062	−0.42	−0.19
Beautiful vs. virtuous	−0.073	0.036	−0.15	−0.01
Human nature rating				
Sexually attractive vs. virtuous	0.015	0.016	−0.005	0.06
Beautiful vs. virtuous	0.01	0.014	−0.005	0.054

Statistical significance is inferred from confidence intervals that do not contain zero; CI, confidence interval; LL, lower limit; UL, upper limit.

DISCUSSION

This study explores three cues linked to women with high long-term mating value, namely a "beautiful" facial appearance, a "sexually attractive" body shape, and "virtuous" behaviors. With exclusive attention being paid to the above cues, participants were asked to assess the human uniqueness and human nature of women, as well as the women's mating opportunities. This study found that a low assessment of women's human uniqueness could negatively affect women's long-term mating opportunities. Interestingly, this result was found in both male and female participants.

Speculation about the relationship between humanness and mating opportunities was confirmed by this study's experimental work. What is surprising about the relationship is that only women's human uniqueness has an effect on women's mating opportunities. Human uniqueness is acquired through cultivation and is thus strongly influenced by cultural backgrounds. In contrast, human nature is a characteristic that represents an individual's inner desires, which occur regardless of the culture or background. Our traditional Confucian Culture emphasizes the view of "preserving the heaven and destroying human desires." This culture advocates the unity of reason and desire, to practice reasonable abstinence, and that human beings can be reformed through education. This trend of thoughts values human uniqueness more than human nature and has obviously provided guidelines regarding individuals' judgments.

With regard to women's mating opportunities, both stereotypes of "beautiful" women and "virtuous" women acquired higher mating opportunity ratings than "sexually attractive" women. The reason why "sexually attractive" women have lower mating opportunities is that these women are assumed to have lower moral value, and just as stated in the previous section, low moral values goes against the spirits of traditional culture. Meanwhile, both male and female participants considered that the "beautiful" woman had the advantage in terms of getting mating opportunities. Actually, beautiful women are more likely than average-looking women to be pursued by members of the opposite sex (Morgan and Kisley, 2014). The results of this study are consistent with that finding. Further, there were gender differences when judging women's mating opportunities, in that female participants assessed more mating opportunities than males, especially in the category

of "virtuous" women. These gender differences could be explained by in-group preference, which means that people could be more optimistic to an in-group member (e.g., when females were assessing the women stereotypes in our study) than to an out-group member (e.g., when the males were assessing the women stereotypes in our study). With regard to "virtuous" women, the reason for the conservative estimation of mating opportunities made by males in this study is that "virtuous" women failed to meet the criteria of having the ability to support a family. The rules of traditional culture are believed to suggest that it is virtuous for women to stay home and obey others' orders (Ma et al., 2008; Tianyu, 2016; Aihong, 2018). Since the implementation of the policy of economic reform and opening up, more women have achieved economic independence. As a result, women's abilities to support their families have been increasingly valued.

With regard to humanness, both "beautiful" women and "virtuous" women were assessed as having higher levels of humanness than "sexually attractive" women. Further, in this study, humanness was divided into two sub-dimensions, human uniqueness and human nature. When the two sub-dimensions were tested, only the "beautiful" woman was assessed as having high levels of human uniqueness and human nature. This result means that focusing exclusively on facial appearance may not only evoke a negative stereotype, but conversely, could also result in positive impressions. Affected by the "beauty is good" effect, people seem to believe that beautiful individuals have all the positive qualities, such as sociability, affinity, understanding, and a lively personality, as well as ability (Dion et al., 1972; Zebrowitz and Rhodes, 2004). Meanwhile, the "virtuous" woman was assessed in this study as having higher human uniqueness but lower human nature. In contrast, the "sexually attractive" woman was assessed as being lower in human uniqueness but higher in human nature. These findings suggest that "virtuous" women suppress their inner desires and behave in a way that is in accordance with cultural approval. In contrast, "sexually attractive" women's behavior is in accordance with their hearts' desires; the behavior is not done deliberately (Vaes et al., 2010).

In this study, the theory of the two-dimensional mode of humanness is extended, from the area of aggression to the area of mating opportunities. The findings of this research verify the mating theories of evolution psychology (Sprecher et al., 1994; Berry and Miller, 2001). Importantly, this study offers another perspective for understanding mating opportunities by highlighting the role of humanness. Previous researches attempted to interpret the mating phenomenon from the theory of the "good genes" hypothesis or the "big five" personality model (Malouff et al., 2010; Walker and Vetter, 2016).

Another key innovation in this study is the exploration of the stereotype of "virtuous" women. In traditional culture, the image of the "virtuous woman" provides guidelines about moral standards and principles to regulate women's behavior. This tradition has encouraged men to develop a negative prejudice toward such women because men were led to believe such women were pedantic, inflexible, and depressed. However, there is scarce knowledge that would help with understanding the housewife in Western culture. Future studies are needed to identify and discuss similarities in this particular image of women between Chinese and Western cultures.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Hunan Normal University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JL and DD designed the research and wrote the manuscript. JL and XC performed the research. DD, JL, and LL analyzed the data and were involved in the interpretation of data. All authors contributed to the article and approved the submitted version.

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Effects of Counter-Stereotypes Cognitive Training on Aging Stereotypes in 12– to 13-Year Olds

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The purpose of this study was to investigate the effect of counter-stereotypes cognitive training on adolescents' aging stereotypes and to further investigate the best training method to intervene in aging stereotypes by comparing the effect of single and multiple intervention training methods on aging stereotypes and their retention effects. Three experiments examined the different intervention outcomes of different counter-stereotypes cognitive training on adolescent aging stereotypes. The study used a randomized block group experimental design and recruited a total of 183 middle school students for testing. Experiment 1 verified the effect of counter-stereotypes cognitive training by taking a single training task (evaluative conditioning technique), randomly assigning subjects to different conditions (training task or unrelated drawing task), and administering a follow-up test 24 h after the posttest. Experiment 2a compared the effects of multiple versus single cognitive training, where we took multiple (adding the counter-stereotypes situational storytelling method) versus single training tasks and administered a follow-up test 72 h after the posttest. Experiment 2b increased the number of training sessions based on Experiment 2a, with a second intervention training 72 h after the end of the posttest and a follow-up test 72 h after the second training. Experimental results suggest that evaluative conditioning techniques are effective in weakening subjects' aging stereotypes, but are less effective in maintaining them. Compared to a single training task, multi-tasking is more effective and the effects of the intervention are maintained for up to a week by increasing the number of training sessions.

Keywords: aging stereotypes, evaluative conditioning technique, teenager, counter-stereotypes, counter-stereotypes scenario

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INTRODUCTION

As the global older adult population continues to grow, population aging will be one of the major issues we face in this century (Cheng and Heller, 2010). Population aging not only hinders the development of the country in various fields, but also has many negative effects on older adults themselves, which have received active attention from researchers in different fields at home and abroad, and researchers have focused their attention on the study of older adults affected by age stereotypes. Our perceptions and expectations of older adults as a specific social group are the aging stereotype (Levy et al., 2000b). A typical and strong stereotype

in Western culture is the negative aging stereotype. Research on aging stereotypes first originated in the 1950s, and with the acceleration of global aging, research on aging stereotypes began to enter a boom in the 1980s to 1990s in the West (He et al., 2013), and its research on aging stereotypes was more adequate. Little research has been done on aging stereotypes in China, but more on aging attitudes associated with aging stereotypes (He et al., 2013), and it has mainly focused on status surveys and the development of measurement instruments. However, population aging is closely related to national politics, economy, and social construction, and as China's population ages, the Chinese government has elevated it to the level of a national strategy. At the same time, respect for older adults is a traditional Chinese virtue, which has led society to give them some special care, but the potential aging stereotype that comes with this special care also pushes them to the margins of society and has a negative impact on their bodies and minds. Therefore, the study of aging stereotypes, especially the negative effects caused by aging stereotypes, has received increasing attention from Chinese scholars (Li, 2010). Negative aging stereotypes as a social cognitive factor have a negative impact on older adults that cannot be ignored. Research has found that aging stereotypes have a significant impact on people's physiology, cognition, behavior, and daily life (He et al., 2013; Bae et al., 2018; Chiviacowsky et al., 2018; Li and Xu, 2018). For example, aging stereotypes can affect individuals' physiological functions, such as blood pressure, hearing (Levy et al., 2000a, 2009), cognitive functions such as memory performance and judgment (Wheeler and Petty, 2001; O'Brien and Hummert, 2006; Radvansky et al., 2010), and everyday habits such as writing and reading, and consumption behavior (Bargh et al., 1996; Levy et al., 2000a; Bae et al., 2018).

With the deepening and expansion of stereotype research by domestic and foreign researchers, research on counter-stereotypes has also been actively developed. Counter-stereotypes are traits exhibited in group members that are inconsistent with or contrary to stereotypes (Garciamarques and Mackie, 1999; Santos et al., 2012), as well as backgrounds that do not match each other (Wittenbrink et al., 2001; Casper, 2010). Among them, counter-stereotypes cognitive training plays a key role in reducing the influence of negative stereotypes. Counter-stereotypes cognitive training has been shown to be effective in diminishing or inhibiting the activation and application of stereotypes across the domains of race, occupation, and gender (Marini et al., 2012; Meijs et al., 2015; Lai et al., 2016; Burns et al., 2017). Although aging stereotypes have not been given corresponding attention in academia (Barber, 2017), aging stereotypes as a socio-cognitive factor, it is reasonable to believe that counter-stereotypes cognitive intervention training may have the same effect in suppressing aging stereotypes and eliminating the negative effects of aging stereotypes on older adults. Lai et al. (2016) found that the counter-stereotypes sample exposure method, counter-stereotypes situational story method, feedback on false implicit-association test (IAT) results, and evaluative conditioning technique were all effective interventions by comparing different counter-stereotypes intervention training methods. Among them, the evaluative conditioning technique and the counter-stereotypes situational storytelling method are easier to operate and maintain the training effect for a longer period. Counter-stereotypes storytelling is an effective way to weaken or eliminate stereotypes by exposing subjects to a variety of typical counter-stereotypes situations. It has been shown that targets are made to exhibit behaviors inconsistent with stereotypes through false story scenarios, news reports, or people's subjective accounts, whether it is a plant-related situation (flowers are dangerous, and insects are safe; Foroni and Mayr, 2005; Lai et al., 2014) or a human-related situation (e.g., black heroes and white villains), which can develop distinct counter-stereotypes through stories (Dasgupta and Greenwald, 2001; Marini et al., 2012; Burns et al., 2017). Some researchers have presented subjects with a compiled report of an assault by using a false story scenario or report. The content of this incident is different from what is usually known, in which the black people in the story are the rescuers and the white people are the attackers (Dasgupta and Greenwald, 2001; Marini et al., 2012). The results were found to be consistent with those of previous studies, indicating that the counter-stereotypes situational storytelling method can effectively inhibit the activation of stereotypes. Counter-stereotypes situational storytelling is a method that uses vivid story scenarios or videos to stimulate the subjects' thinking and thus inhibit the activation of stereotypes. This method applies to a variety of vivid situations, such as racial stereotypes and age stereotypes. However, this method has strict requirements for the selection and evaluation of story materials.

The evaluative conditioning technique is a method discovered and named by (Martin and Levey, 1978), which focuses on making a relevant connection between two things through multiple pairwise evaluations and transferring attitudes, emotions, etc., about one thing to the other. The associative-propositional evaluation model summarized by Gawronski and Bodenhausen (2006) found that the typical method of changing implicit attitudes is a progressive change in social structure achieved through the action of evaluative conditioning (Burns et al., 2017). For example, Dijksterhuis (2004) used an evaluative conditioning technique in which subjects repeatedly paired their self-represented words with positive words and found that their implicit self-esteem was effectively increased after repeated practice. Other researchers have found that having pairs of subjects repeatedly paired with pictures of faces (black faces and white faces) and stimulus potency words (positive and negative) can be effective in changing subjects' internalized biases and stereotypes through multiple exercises (De et al., 2001; Olson and Fazio, 2001, 2002, 2006; Burns et al., 2017). The evaluative conditioning technique applies to a wide range of conditions and can be applied to a variety of stereotype intervention training such as race, gender, and age. The evaluative conditioning technique is simpler and more efficient than other intervention techniques. However, this technique also tends to produce practice effects in subjects.

However, comparing previous studies found that the effects of both counter-stereotypes cognitive intervention training had better effects in the short term; however, the effects of the

intervention training were poorly maintained and the effects of conducting a single intervention training were only maintained for a few hours or days (Burns et al., 2017). In summary, we found that the training modalities used by researchers in previous studies were homogeneous, the number of intervention training sessions was limited, and few follow-up studies were conducted (Dasgupta and Greenwald, 2001; De et al., 2001; Marini et al., 2012; Burns et al., 2017), although the intervention training was effective but poorly maintained. From this, we can speculate that the reasons for the short-term effectiveness of the intervention training and the poor maintenance of the long-term effect may be due to the single mode of intervention training and the insufficient intensity and frequency of the intervention training. Therefore, whether enriching the intervention and increasing the intensity and frequency of the intervention training can achieve the counter-stereotypes effect to a greater extent will be one of the questions to be explored in this study.

In addition, the age of the subjects had an important effect on the intervention effect. Research on aging stereotypes suggests that aging stereotypes include not only stereotypes of older adults about themselves, but also stereotypes of older adults by groups other than older adults (Levy, 2003; Hess et al., 2004; Remedios et al., 2010). Previous research has shown that activation of stereotypes of aging in young people also affects young people's performance in cognition (Zafeiriou and Gendolla, 2017) and that young people can achieve the same level of cognitive performance as older adults by mobilizing less energy in cognitive tasks compared to older adults (Smith and Hess, 2015). This is due to the high cognitive plasticity of young people and the ease with which formed biases, stereotypes, etc., can be changed (Bigler and Liben, 2006; Lai et al., 2014, 2016). Among these, childhood is a critical period of cognitive development and an important stage for changing stereotypes, where prejudice and stereotypes may be the easiest to change (Devine, 1989; Greenwald and Banaji, 1995; Rudman and Fairchild, 2004). In addition, evidence based on social cognitive development studies suggests that implicit bias may be more likely to change in older children and that this mechanism may better allow older children to change their evaluations of the group after exposure to counter-stereotypes (Lai et al., 2014). For example, Gonzalez et al. (2017) used the counter-stereotypes sample exposure method to expose children and adolescents aged 5–13 years to a positive and positive Black sample and found that age differences had a significant impact on the intervention effects of the training, and while there was a reduction in children's prejudice against black people, it was limited to adolescents aged 10 to 13 years, the age group most prominently affected by the counter-stereotypes intervention training and where implicit prejudice was most likely to change.

In summary, by comparing previous studies, we found that the current counter-stereotypes cognitive intervention training has the following limitations: (1) The cognitive intervention training used is relatively homogeneous (2) intervention effects are poorly maintained and effective only in the short term (3) fewer interventions and fewer follow-up studies were conducted, and (4) subjects were selected mostly from adults and less from adolescents with high cognitive plasticity. Therefore, the controversies and shortcomings of the above training methods, training intensity, and age effects on the effect of counter-stereotypes intervention training are addressed. In this study, we selected junior high school students (12–13 years old) with high social cognitive plasticity as subjects and used the evaluative conditioning technique and the counter-stereotypes situational storytelling method to enrich the intervention training, extend the duration of the intervention training, and increase the frequency of the intervention training, and to measure the retention effect of the counter-stereotypes cognitive intervention training through a follow-up study. Two hypotheses are proposed in this study: (1) Single-task intervention training (evaluative conditioning techniques) can be effective in weakening aging stereotypes in secondary school students and (2) compared to single-task intervention training, multiple training tasks are more effective and longer lasting in weakening aging stereotypes in secondary school students.

EXPERIMENT 1: THE EFFECT OF A SINGLE TRAINING TASK ON AGING STEREOTYPES

Experiment 1 was conducted to better understand whether single-task intervention training can effectively weaken the aging stereotypes of middle school students and to further verify the results of previous intervention training research.

Method

Participants

Seventy students ($M_{age} = 12.31$, $SD = 0.50$) participated in Experiment 1. All participants were randomly recruited from three seventh-grade classes at a middle school in Zunyi, Guizhou province. Six participants failed to complete all the tests due to a computer glitch, and three participants in the pretest did not complete the experimental tracking. After D-value treatment, it was found that the response errors of the three participants exceeded 70%. Therefore, 58 effective samples were finally obtained (31 in the experimental group and 27 in the control group). All recruited participants had normal or corrected-to-normal vision, were proficient in using computers, and had not participated in a similar experiment before. All participants had parental consent before taking part in the experiment and were given a small gift at the end.

Materials

The experimental materials consisted mainly of IAT materials and intervention training materials. First, we selected conceptual and attribute words for older adults and younger adults by distributing a questionnaire (**Appendix 1**). The questionnaire was divided into three main parts. The first part asked the subjects to write conceptual words related to older adults and younger people. The second part required subjects to write at least five adjectives related to physical characteristics (describing

the bodies of older adults and younger people), cognitive characteristics (about the cognitive abilities of younger and older adults), and personal expressions (about attitudes, mental states, etc.) of attributes related to older adults and younger people. The third part asked the subjects to write positive and negative words that describe the physical characteristics, cognitive characteristics, and personal expressions of the individuals. A total of 150 copies of vocabulary questionnaires were sent out, and 139 valid questionnaires were collected. The questionnaires were recovered after word frequency analysis and screening and combined with the vocabulary used in the measurement of age stereotypes by He et al. (2013), Li (2010), and Zuo et al. (2007). We ended up with the following findings:

1. Concept words: 15 for older adults and 15 for the young.
2. Attribute words: 46 attribute words describing physical characteristics of older adults and younger adults (22 for older adults and 24 for younger adults), 52 attribute words describing personal expressiveness (26 for older adults and 26 for younger adults), and 44 attribute words describing cognitive characteristics (20 for older adults and 24 for younger adults).
3. Positive or negative words: 49 positive or negative words describing physical characteristics of older adults and younger adults (23 positive and 26 negative), 45 positive or negative words describing cognitive characteristics (23 positive and 22 negative), and 64 positive or negative words describing personal expressiveness (32 positive and 32 negative).

We screened and organized the collected words and then recruited subjects again to perform a secondary evaluation of the screened words (**Appendix 2**). Considering that college students have higher knowledge and relatively mature cognition, they have a richer understanding of older adults and younger people and are more likely to judge and filter the vocabulary. Therefore, we recruited a total of 30 university students enrolled in the School of Psychology and selected relevant conceptual words, positive and negative words, and attribute words by analyzing the word frequency of the subjects' vocabulary evaluation results and then ranking them according to the evaluation results in order. We ended up with the following findings:

1. 20 concept words: 10 for older adults and 10 for younger adults. Older adults concept words, such as crutches and wheelchairs, and younger adults concept words, such as games and staying up late.
2. 36 positive and negative words: 6 positive words describing physical characteristics of individuals, such as tall and fit; 6 negative words, such as clumsy and weak. Six positive words describing the individual's cognitive abilities, for example, extremely intelligent and capable. Six negative words, such as unresponsive and clumsy. Six positive words describing personal expressiveness, for example, enthusiastic and clear. Six negative words, such as cranky and pessimistic.
3. 60 attribute words: 20 attribute words describing physical characteristics of older adults and younger adults, such as gray hair and robust, 20 attribute words describing cognitive characteristics, such as unresponsive and eloquent, and 20 attribute words describing personal expressiveness, such as nagging and cranky (See **Appendix 3**).

The measurement used in the present study was adopted from the classic IAT paradigm of Greenwald et al. (1998) and the IAT 7 (Block) paradigm used by He et al. (2013) and Li (2010). The experimental program was compiled using E-prime 2.0 (see **Table 1**).

Design and Procedure

The experiment used a 2 (group: experimental group, control group) × 3 (measurement time: pretest [IAT_1], posttest [IAT_2], and intervention effect tracking test [IAT_3]) mixed design, and the dependent variable was the effect value (D) after the average reaction time before and after the IAT was converted *via* the Greenwald et al. (2003) method.

The participants were randomly assigned to either the experimental group or the control group, and the test time was arranged according to the different groups after the allocation. Each participant completed a practice experiment before starting the formal test, which lasted for 2 min, and the formal test began after all the participants finished the practice experiment and confirmed they understood the experimental procedure.

During the formal test, the tasks performed by the experimental group and the control group were different. The test group was required to complete the pretest (IAT_1), intervention training task, posttest (IAT_2), and tracking test (IAT_3). The control group was required to complete the pretest (IAT_1), unrelated drawing task, posttest (IAT_2), and tracking test (IAT_3). The pretest confirmed the baseline value, and the interval of the tracking test was 24 h. See **Figure 1** for the specific schedule of the experiment. The intervention training task program was compiled using E-prime2.0, and the materials comprised the collected positive and negative words. Intervention training mainly combined the evaluative conditioned reflex technology adopted by Burns et al. (2017) and Li (2010). The procedure of the intervention was as follows: First, the instruction was presented in the center of the screen with a white background, and the subject understood the instruction and pressed the space bar, followed by a blank screen at 66.67 ms. The blank screen disappeared, and then, the stimulus (young vocabulary (fashion) or old vocabulary (crutches)) was presented for 13.33 ms without requiring the subject to respond to the stimulus. After the stimuli were presented, a blank screen was then presented for 66.67 ms, and after the blank screen disappeared, positive words (wise, older adults) or negative words (cranky, younger adults) were presented, at which point the subjects were asked to categorize the words that appeared (by pressing the "F" key or the "J "key), positive attribute words ("F" key) negative attribute words ("J" key), intervention training for a total of two hundred trials of positive (wise, older adults) and negative (cranky, young adults) lexical matches, and the results of the training were not counted in the final statistical analysis. (See **Figure 2**).

After completing the training task, the experimental group rested for 30 min before completing the posttest (IAT_2) and continued with the follow-up test of training effects (IAT_3)

TABLE 1 | Flow chart of IAT test procedure.

Test program(Block)	Task Description	Function	Trial run	Operational tasks	Sample
Block 1	Judgment of age concept words	Practice	10	F: Old people's things J: Youth thing	F: Crutch J: Basketball
Block 2	Age attribute word judgment	Practice	10	F: The older adults J: The young man	F: Grandmotherly J: Brave
Block 3	Compatible concept-attribute word joint judgment	Practice	30	F: Old people's things-The older adults J: Youth thing-The young man	F:Crutch-Grandm-otherly J:Basketball-Brave
Block 4	Compatible concept-attribute word joint judgment	Test	120	F: Old people's things-The older adults J: Youth thing-The young man	F:Crutch-Grandm-otherly J:Basketball-Brave
Block 5	Age attribute word judgment	Practice	10	F: The older adults J: The young man	F: Grandmotherly J: Brave
Block 6	Incompatible concept-attribute word joint judgment	Practice	60	F: Old people's things-The young man J: Youth thing-The older adults	F: Crutch-BraveJ:Basketball-Gran-dmotherly
Block 7	Incompatible concept-attribute word joint judgment	Test	120	F: Old people's things-The young man J: Youth thing-The older adults	F: Crutch-Brave J:Basketball-Gran-dmotherly

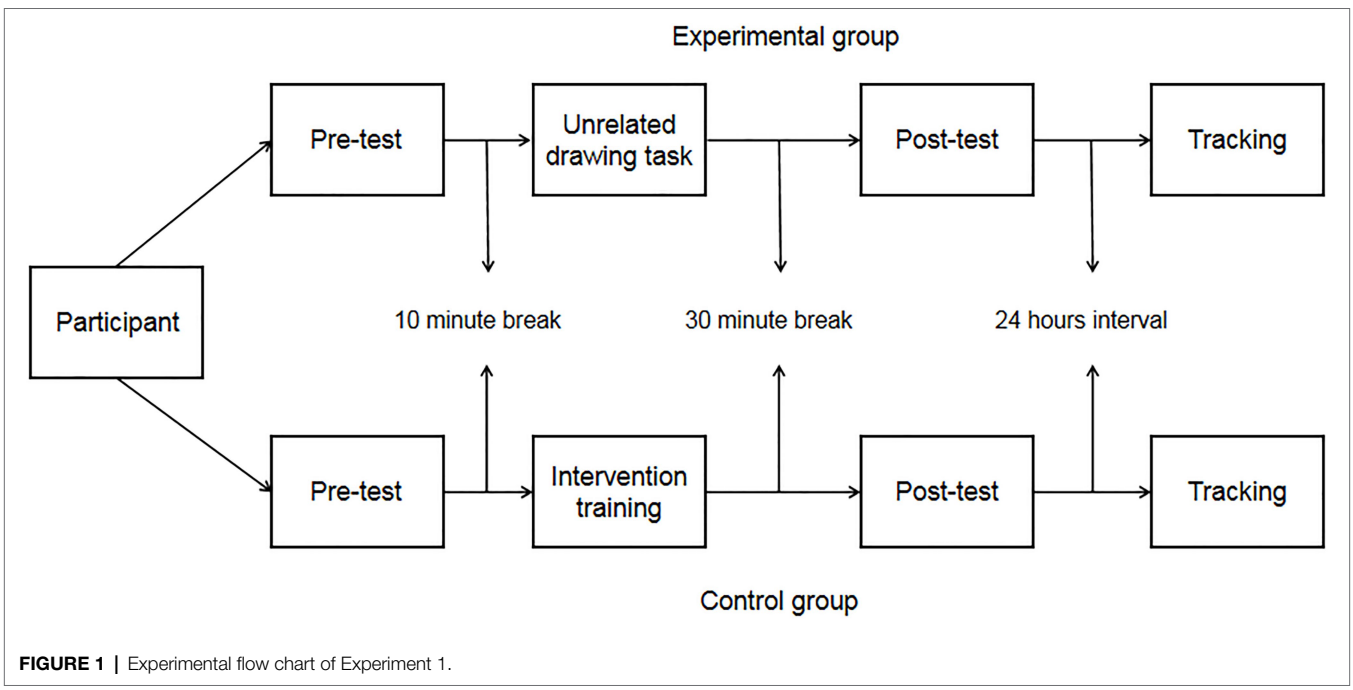

FIGURE 1 | Experimental flow chart of Experiment 1.

after an interval of 24 h. After completing the IAT pretest, the control group took a 10-min break, after which they completed the painting task. After completing the drawing task, a 30-min break was taken, followed by a posttest (IAT_2), and a 24-h interval followed by a follow-up test (IAT_3).

Results and Analysis

Reactions measured by IAT were processed and converted by calculating the effect value (D) using the method proposed by Greenwald et al. (2003). Repeated measures analysis of variance (ANOVA) showed that the main effect of measurement time was significant, $F(2, 112) = 14.65$, $p < 0.001$, $\eta_p^2 = 0.21$. The multiple comparison results showed that in the control group, the effect value of pretest and posttest was not significantly different, $t(26) = 1.08$, $p = 0.29$, *Cohen's* $d = 0.42$ ($M_{c\text{-}pre} = 0.73$, $SD = 0.45$, $M_{c\text{-}post} = 0.61$, $SD = 0.28$). There was also no significant difference between the posttest effect value and tracking test effect value in the control group, $t(26) = 1.38$, $p = 0.18$, *Cohen's* $d = 0.54$ ($M_{c\text{-}post} = 0.61$, $SD = 0.28$, $M_{c\text{-}tra} = 0.49$, $SD = 0.32$). However, the pretest effect value was significantly different from the tracking test effect value in the control group, $t(26) = 2.06$, $p = 0.016$, *Cohen's* $d = 0.81$ ($M_{c\text{-}pre} = 0.73$, $SD = 0.45$, $M_{c\text{-}tra} = 0.49$, $SD = 0.32$). In the experimental group, there was a significant difference between the pretest and posttest effect values, $t(30) = 5.11$, $p < 0.001$, *Cohen's* $d = 1.87$ ($M_{e\text{-}pre} = 0.87$, $SD = 0.47$,

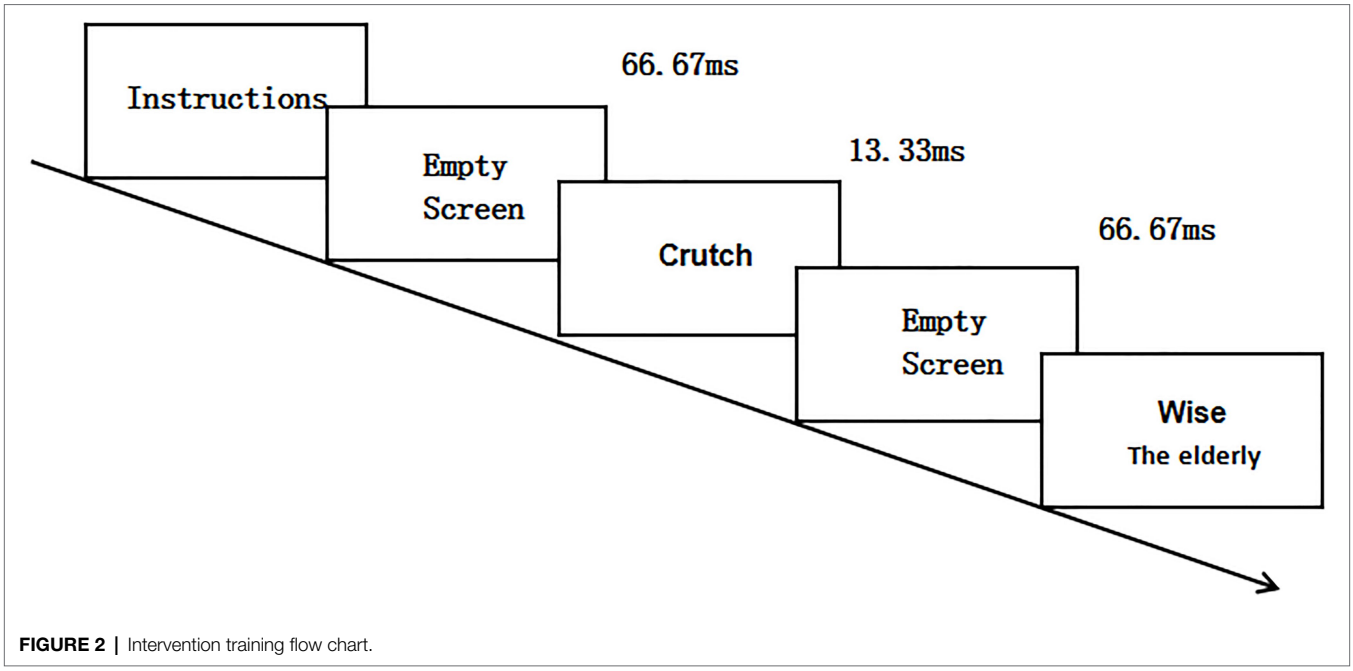

FIGURE 2 | Intervention training flow chart.

TABLE 2 | Mean IAT effect values (D) by group.

Group	Pretest *M(SD)*	Posttest *M(SD)*	Tracking *M(SD)*
Control group	0.73(0.45)	0.61(0.28)	0.49(0.32)
Experimental group	0.87(0.47)	0.39(0.31)	0.48(0.27)

[a]*N* = 58.

$M_{e\text{-}post} = 0.39$, $SD = 0.26$). There was no significant difference between the posttest and tracking effect values in the experimental group, $t(30) = -1.56$, $p = 0.13$, *Cohen's* $d = -0.57$ ($M_{e\text{-}pre} = 0.39$, $SD = 0.26$, $M_{e\text{-}tra} = 0.48$, $SD = 0.27$). However, there was a significant difference between the pretest and tracking effect values in the experimental group, $t(30) = 3.66$, $p < 0.001$, *Cohen's* $d = 1.34$ ($M_{e\text{-}pre} = 0.87$, $SD = 0.47$, $M_{e\text{-}tra} = 0.48$, $SD = 0.27$). The main effect of group was not significant, $F(1, 56) = 0.31$, $p = 0.577$, $\eta_p^2 = 0.006$. (see **Table 2**).

The interaction between group and measurement time was significant, $F(2, 112) = 3.82$, $p = 0.03$, $\eta_p^2 = 0.07$. Simple effects analysis showed that the pretest effect values of the experimental and control groups were larger than the pretest effect values of the control group, which indicated that the stereotypes were stronger in the experimental group than in the control group before the intervention training, but there was no too significant difference between the two groups of subjects, $F(1,56) = 1.34$, $p = 0.25$, $\eta_p^2 = 0.023$ ($M_{e\text{-}pre} = 0.87$, $SD = 0.47$, $M_{c\text{-}pre} = 0.73$, $SD = 0.45$). Compared with the control group, the posttest effect value of the experimental group was significantly lower $F(1, 56) = 9.49$, $p = 0.003$, $\eta_p^2 = 0.15$ ($M_{e\text{-}post} = 0.39$, $SD = 0.26$, $M_{c\text{-}post} = 0.61$, $SD = 0.28$). This suggested that intervention training can effectively weaken aging stereotypes in participants. After 24 h, tracking tests found that the effect value of the experimental group was not different from that of the control group, $F(1,56) = 0.02$, $p = 0.88$, $\eta_p^2 = 0.000$ ($M_{e\text{-}tra} = 0.49$, $SD = 0.32$, $M_{c\text{-}tra} = 0.48$, $SD = 0.27$), which indicated that although the intervention training was effective, the effects remained poor and began to decline after 24 h (see **Figure 3**).

Discussion

The results of Experiment 1 replicated previous studies and proved that counter-stereotypes intervention training could effectively suppress aging stereotypes. Although the participants were selected differently and only underwent one intervention, the results of the intervention training were consistent with those of the adult participants in previous studies (Aboud, 2005; Baron, 2015; Lai et al., 2016; Burns et al., 2017). Although the effect of intervention training was maintained poorly and gradually declined after 24 h, it did prove that the aging stereotype of the participants could be weakened to a certain extent.

EXPERIMENT 2A: A COMPARATIVE STUDY OF MULTIPLE TRAINING TASKS VERSUS SINGLE TRAINING TASKS

Experiment 2a was conducted to examine whether the dual intervention training tasks (adding counter-stereotypes scenario method) or a single intervention training task (evaluative conditioning technique) would have better effects over a longer period. Therefore, in Experiment 2a, we gave the experimental group dual training tasks and the control group a single training task and then determined which group showed better retention of training effects when performing different tasks.

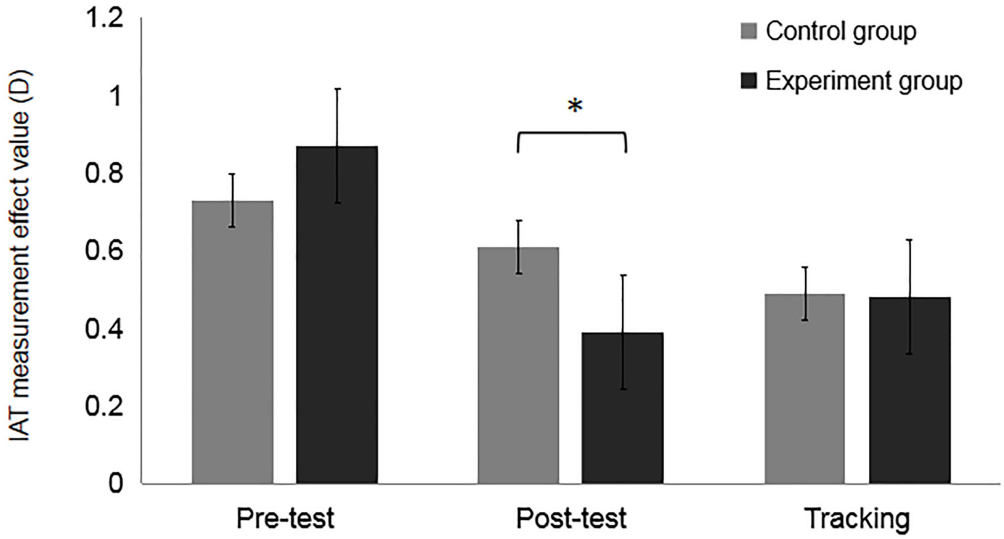

FIGURE 3 | Results of the measurement of the effect value (D) of the training effect for different groups, *$p < 0.001$.

Method

Participants

Seventy students ($M_{age} = 12.28$, $SD = 0.45$) participated in Experiment 2a. All participants were randomly recruited from the seventh grade of a middle school in Zunyi, Guizhou province, and were 12–13 years old. Two participants did not complete all the experimental tests due to a computer error, and two participants in the pretest did not complete the tracking test. After D-value treatment, it was found that the response errors of the two participants exceeded 70%; therefore, 64 effective samples were finally obtained (34 in the experimental group and 30 in the control group). All recruited participants had normal or corrected-to-normal vision, were proficient in using computers, and had not participated in a similar experiment before. All participants volunteered and were given a small gift at the end of the experiment.

Materials

Both the experimental and control groups were required to complete two tasks, where the experimental group was required to complete a training task (evaluative conditioning technique) and a video viewing task (counter-stereotypes situational story), and the control group was required to complete a training task (evaluative conditioning technique) and an unrelated drawing task. The material we use is counter-stereotypes scenario material for older adults (Older adults' counter-stereotypes video material, video material from "Dream Rider," a commercial based on a true story by Taiwan Public Bank, 3 min long). Thirty subjects were recruited to use the PANAS-X Positive Affect Self-Assessment Scale (Chinese version) (The Positive Affect Scale, PAS) to rate the pleasantness, arousal, and intensity of positive affect of the video using a Likert 9-point scale ranging from 1 (almost none) to 9 (very much) (see **Appendix 3**). The results of the subjects' evaluations of the videos indicate that the videos are good at evoking positive impressions of the subjects about the older adults (See **Table 3**).

TABLE 3 | Evaluation results for video materials.

Valence *M*(*SD*)	Arousal *M*(*SD*)	Positive emotional intensity *M*(*SD*)
6.37(1.56)	7.23(1.19)	6.83(1.39)

[a]*N* = 30.

Design and Procedure

A 2 (group: experimental group [dual-task], control group [single-task]) × 3 (measurement time: pretest [IAT_1], posttest [IAT_2], intervention effect tracking test [IAT_3 after 72 h]) mixed design was used, and the dependent variable was the effect value (D) after the average reaction time before and after the IAT was converted *via* the Greenwald et al. (2003) method.

The participants were randomly assigned to either the experimental group or the control group, and the test time was arranged according to the different groups after the allocation. Each participant completed a practice experiment before starting the formal test, which lasted for 2 min, and the formal test began after all the participants finished the practice experiment and confirmed they understood the experimental procedure.

During the formal test, the tasks performed by the experimental group and the control group were different. The experimental group was required to complete pretest (IAT_1), intervention training task, video task, posttest (IAT_2), and tracking test (IAT_3). The control group was required to complete the pretest (IAT_1), intervention training task, unrelated drawing task, posttest (IAT_2), and tracking test (IAT_3). The pretest confirmed the baseline value, and the interval of the tracking test was 72 h. See **Figure 4** for the specific schedule of the experiment. After watching the video (counter-stereotypes scenario story), the experimental group was required to answer two questions related to the video (such as: 1. What kind of

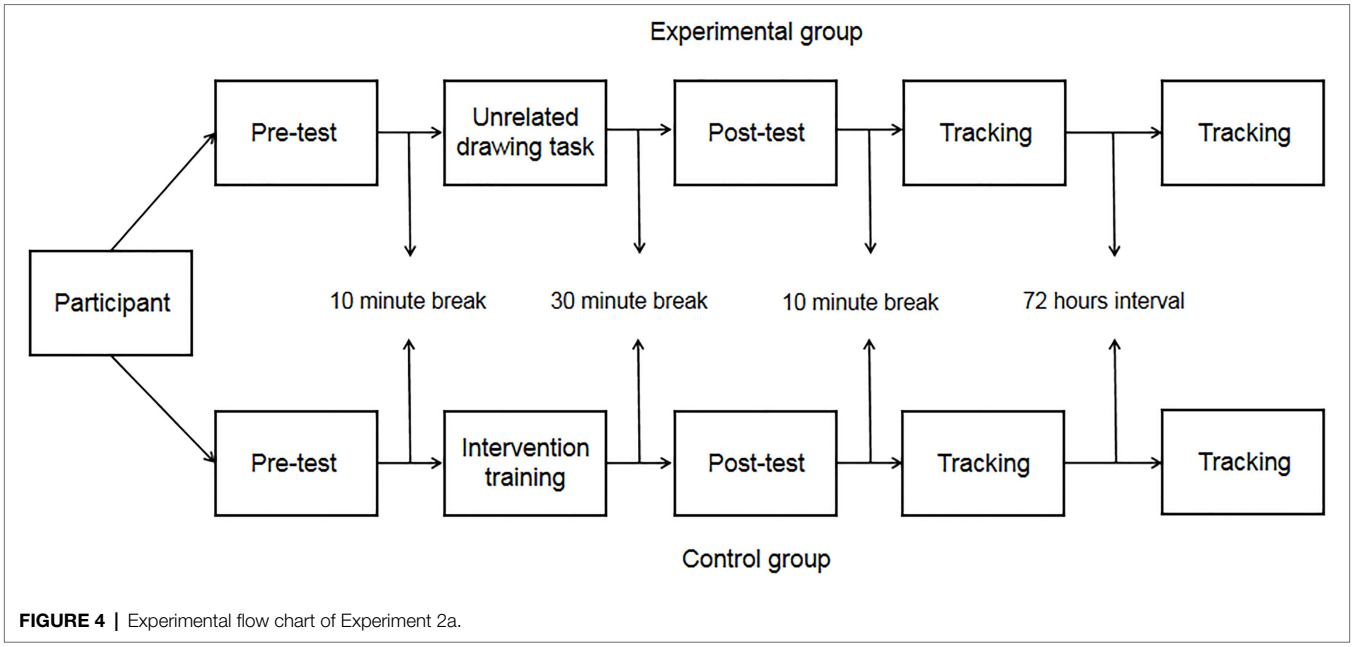

FIGURE 4 | Experimental flow chart of Experiment 2a.

story does the video mainly tell? and 2. What do you think of your grandparents after watching the video?).

Results and Analysis

The data processing method of Experiment 2a was the same as that of Experiment 1, both of which were processed by the D-value calculation method of Greenwald et al. (2003). After the data processing of Experiment 2a, 64 valid data samples were obtained (experimental group 34, control group 30).

A repeated measures ANOVA showed that the main effect of measurement time was significant, $F(2,124) = 22.07$, $p < 0.001$, $\eta_p^2 = 0.26$. The multiple comparison results showed that in the control group, there was a significant difference between the pretest and posttest effect values, t (29) = 2.50, $p = 0.018$, *Cohen's d = 1.67* ($M_{c\text{-}pre} = 0.75$, $SD = 0.35$, $M_{c\text{-}post} = 0.53$, $SD = 0.23$). There was no significant difference between the tracking test effect value and the posttest effect value in the control group, $t(29) = -0.42$, $p = 0.68$, *Cohen's d* = −0.16 ($M_{c\text{-}tra} = 0.58$, $SD = 0.35$, $M_{c\text{-}post} = 0.53$, $SD = 0.23$). The difference between the pretest and the tracking test effect values in the control group was significant, $t(29) = 2.15$, $p = 0.04$, *Cohen's d = 0.80* ($M_{c\text{-}pre} = 0.75$, $SD = 0.35$, $M_{c\text{-}tra} = 0.58$, $SD = 0.35$).

There was significant difference in the effect value of the experimental group between the pretest and posttest, $t(33) = 4.22$, $p < 0.001$, *Cohen's d = 1.47* ($M_{e\text{-}pre} = 0.84$, $SD = 0.37$, $M_{e\text{-}post} = 0.50$, $SD = 0.31$). There was also a significant difference between the tracking and the posttest effect values of the experimental group, t (33) = 3.59, $p < 0.001$, *Cohen's d* = 1.25 ($M_{e\text{-}post} = 0.50$, $SD = 0.31$, $M_{e\text{-}tra} = 0.27$, $SD = 0.20$). The effect values of the pretest and tracking test in the experimental group were significantly different, $t(33) = 7.24$, $p < 0.001$, *Cohen's d = 2.52*($M_{e\text{-}pre} = 0.84$, $SD = 0.37$, $M_{e\text{-}tra} = 0.27$, $SD = 0.20$) (see **Table 4**).

The interaction between group and measurement time was significant, F (2, 124) = 6.22, $p = 0.003$, $\eta_p^2 = 0.09$. Simple effects analysis showed that the effect values of the experimental group pretest were slightly larger than the effect values of the control group pretest in the group and measurement time pretest conditions, and there was no too significant difference between the effect values of the two groups pretest, $F(1,62) = 1.00$, $p = 0.32$, $\eta_p^2 = 0.02$($M_{e\text{-}pre} = 0.84$, $SD = 0.37$, $M_{c\text{-}pre} = 0.75$, $SD = 0.35$), indicating that there were no differences in subjects between the two groups. In the group and measurement time posttest conditions, the control group posttest effect values were slightly larger than the experimental group posttest effect values, and there was no significant difference between the two groups, $F(1,62) = 0.15$, $p = 0.70$, $\eta_p^2 = 0.02$ ($M_{c\text{-}post} = 0.53$, $SD = 0.23$, $M_{e\text{-}post} = 0.50$, $SD = 0.31$). Under the conditions of group and measurement time tracking test, the effect values of the control group tracking test were significantly larger than the effect values of the experimental group tracking test, and the effect values of the experimental and control group tracking tests were significantly different, $F(1,62) = 18.55$, $p < 0.001$, $\eta_p^2 = 0.23$ ($M_{e\text{-}tra} = 0.27$, $SD = 0.20$, $M_{c\text{-}tra} = 0.58$, $SD = 0.35$). This indicates that the effects of the intervention training were better maintained in the experimental group (See **Figure 5**).

TABLE 4 | Mean IAT effect values (D) by group.

Group[a]	Pretest *M(SD)*	Posttest *M(SD)*	Tracking *M(SD)*
Control group	0.75(0.35)	0.53(0.23)	0.58(0.35)
Experimental group	0.84(0.37)	0.50(0.31)	0.27(0.20)

[a]*N = 64.*

Discussion

The results of Experiment 2a found no significant difference between the experimental and control groups for both posttest results (see **Figure 5**). However, the results of the experimental

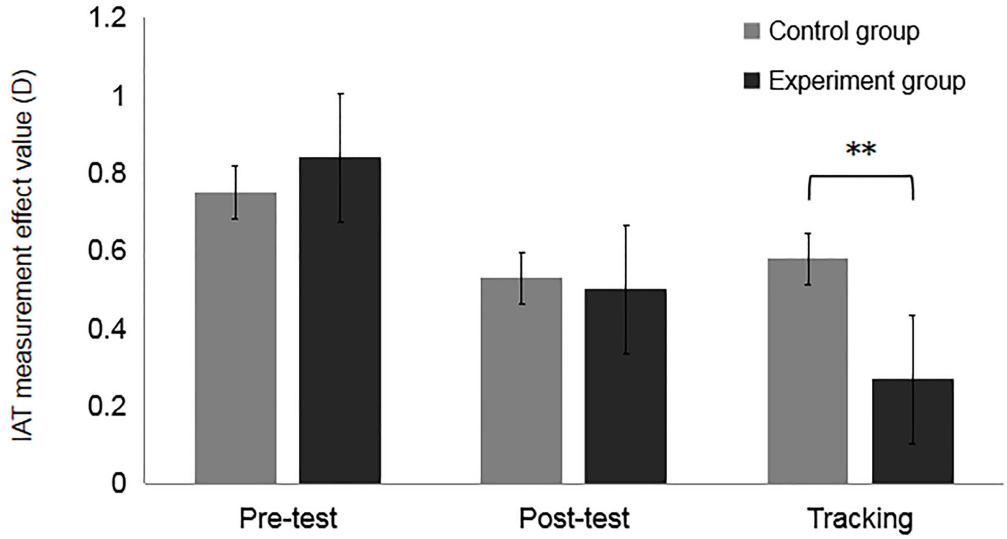

FIGURE 5 | Results of the measurement of the effect value (D) of the training effect for different groups, $^{**}p < 0.01$.

and control groups differed significantly between the pretest and posttest after the intervention training, which was the same as the results of Experiment 1. The results of the follow-up test after 72 h showed significant differences between the experimental and control groups. The results of the experimental group tracking test differed significantly from those of the posttest, but the results of the control group tracking test did not differ significantly from those of the posttest, and the results of the control group tracking test indicated that the effects of the intervention training were declining (see **Figure 5**).

The analysis of the results of Experiment 2a revealed that the retention effect of the intervention training could be effectively improved by increasing the training task and selecting a group of subjects with higher cognitive plasticity, and the retention effect of the intervention training could be effectively promoted by using the counter-stereotypes scenario story method.

EXPERIMENT 2B: INTERVENTION TRAINING EFFECT MAINTENANCE TRACKING TEST

In Experiments 1 and 2a, we conducted a tracking test comparison between two intervention methods. Experiment 2b adopted the same experimental design as Experiment 2a. The intervention training was conducted 72 h after the completion of the pretest and posttest to ascertain which group's intervention training effects lasted longer. In previous studies conducted in other countries, intervention training effects were shown to be maintained for a few hours or days at most (Lai et al., 2016; Burns et al., 2017). However, this previous research did not specify how many days the intervention effects lasted. Therefore, on the basis of previous studies, Experiment 2b explored whether the effect of intervention training could be effectively maintained for several days after increasing intervention training tasks and training times.

Method

Participants

Seventy students ($M_{age} = 12.15$, $SD = 0.36$) participated in Experiment 2b. All participants were randomly recruited from class six to class seven in the seventh grade of a middle school in Zunyi, Guizhou province, and were 12–13 years old. Two participants did not complete all the tests because the speed of the test was too slow. Two participants failed to complete all the experimental tests due to computer error and two participated in the pretest but did not complete the tracking. After D-value treatment, it was found that the response errors of three participants exceeded 70%, so 61 effective samples were finally obtained (31 in the experimental group and 30 in the control group). All the recruited participants had normal or corrected-to-normal vision, were proficient in using computers, and had not participated in a similar experiment before. All participants volunteered and were given a small gift at the end of the experiment.

Materials

The experimental materials and measuring tools are the same as those in Experiment 2a.

Design and Procedure

The experimental materials and measurement tools were the same as those used in Experiment 2a. A 2 (group: experimental group [dual training tasks], control group [single training task]) × 3 (measurement time: pretest [IAT_1], posttest [IAT_2], Intervention Effect Tracking Test (IAT_3) (after the second intervention training, 72 h apart) mixed design with the dependent variable being the mean response time before and after the

IAT test transformed by Greenwald et al. (2003) method of treatment for the effect value D-value.

The subjects were randomly assigned to the experimental and control groups, and the test time was arranged according to the different groups after the assignment was completed, and the specific schedule of the experiment is shown in **Figure 6**. Before the formal experiment, each subject completed a practice experiment, which lasted 2 min, until the subject indicated that they had fully understood the procedure and then the formal experiment began.

In the formal experiment, the experimental group completed the dual training tasks, while the control group completed single training tasks (same as Experiment 2a). In addition, the experimental group and the control group were required to repeat the training task and video/irrelevant drawing task 72 h after the completion of the posttest (IAT_2), followed by the tracking test 72 h later (IAT_3). See **Figure 6** for the specific schedule of the experiment. After completing the video task (counter-stereotypes scenario) for the first time, the participants in the experimental group were asked the same questions as in Experiment 2a. After completing the video task (counter-stereotypes scenario) for the second time, the participants in the experimental group were asked different questions (such as 1. What is the average age of the older adults in the video? and 2. What do the older adults in the video do?).

TABLE 5 | Mean IAT effect values (D) by groups.

Group[a]	Pretest *M(SD)*	Posttest *M(SD)*	Tracking *M(SD)*
Control group	0.85(0.46)	0.62(0.32)	0.75(0.30)
Experimental group	0.88(0.38)	0.55(0.35)	0.38(0.29)

[a]$N = 61$.

Results and Analysis

The data processing method of Experiment 2b was the same as that of Experiment 2a, with the D-value calculation method proposed by Greenwald et al. (2003). After processing the data of Experiment 2b, we obtained 61 valid data samples (experimental group 31 and control group 30).

Repeated measures ANOVA showed that the main effect of measurement time was significant, $F(2,118) = 13.25$, $p < 0.001$, $\eta_p^2 = 0.18$. The multiple comparison results showed that in the control group, the effect value of the pretest was significantly different from that of the posttest, $t\ (29) = 2.50$, $p = 0.018$, *Cohen's* $d = 0.93$ ($M_{c\text{-}pre} = 0.85$, $SD = 0.46$, $M_{c\text{-}post} = 0.62$, $SD = 0.32$). There was no significant difference between the tracking test effect value and the posttest effect value in the control group, $t(29) = -1.44$, $p = 0.16$, *Cohen's* $d = -0.53$. There was also no significant difference between the pretest effect value and the tracking test effect value in the control group, $t(29) = 1.00$, $p = 0.32$, *Cohen's* $d = 0.37$. There was a significant difference between the pretest and posttest effect values in the experimental group, $t(30) = 3.30$, $p = 0.002$, *Cohen's* $d = 1.20$ ($M_{e\text{-}pre} = 0.88$, $SD = 0.38$, $M_{e\text{-}post} = 0.55$, $SD = 0.35$). There was a significant difference between the tracking effect value and the posttest effect value in the experimental group, $t(30) = 2.16$, $p < 0.001$, *Cohen's* $d = 0.79$ ($M_{e\text{-}tra} = 0.38$, $SD = 0.29$, $M_{e\text{-}post} = 0.55$, $SD = 0.35$). There was also a significant difference between the pretest effect value and the tracking effect value in the experimental group, $t(30) = 5.68$, $p < 0.001$, *Cohen's* $d = 2.07$ ($M_{e\text{-}pre} = 0.88$, $SD = 0.38$, $M_{e\text{-}tra} = 0.38$, $SD = 0.29$). (see **Table 5**).

The interaction between group and measurement time was significant, $F(2, 118) = 4.93$, $p = 0.009$, $\eta_p^2 = 0.07$. Simple effects analysis showed that the effect values of the experimental group pretest were slightly larger than those of the control group pretest under the group and measurement time pretest conditions, and there was no significant difference between the effect values

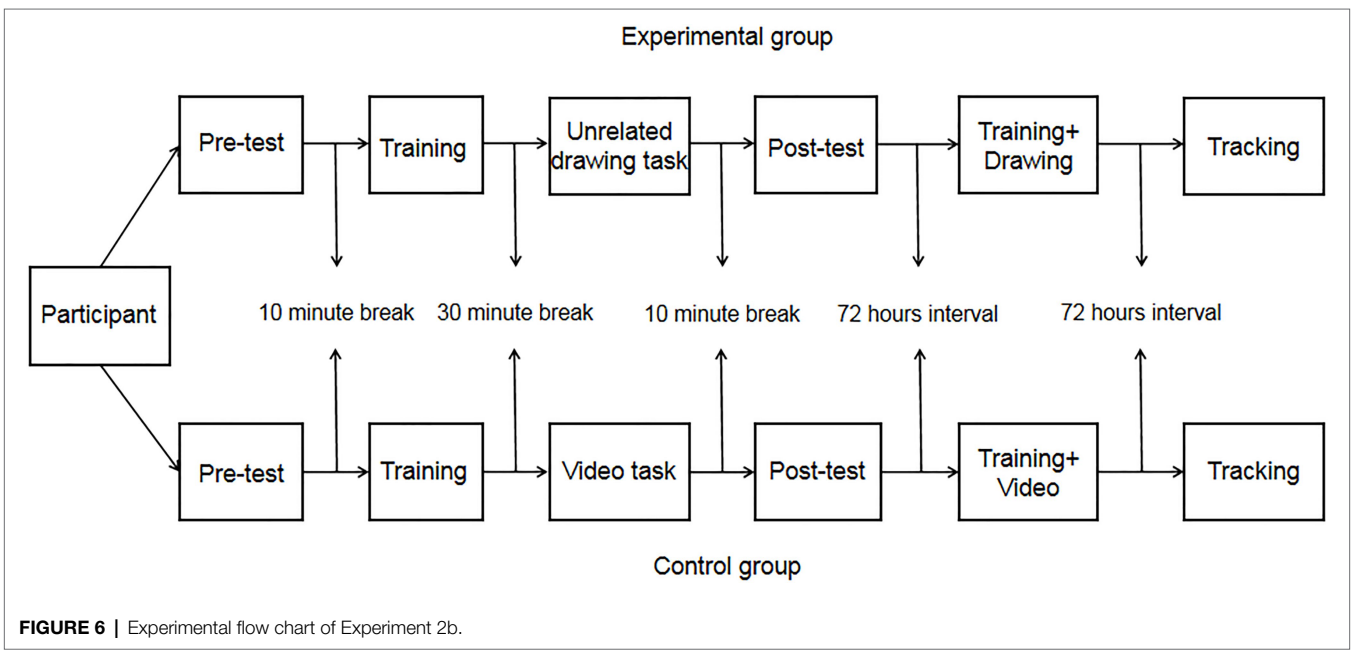

FIGURE 6 | Experimental flow chart of Experiment 2b.

of the experimental group pretest and the control group pretest, $F(1, 59) = 0.07$, $p = 0.79$, $\eta_p^2 = 0.001$ ($M_{e\text{-}pre} = 0.88$, $SD = 0.38$, $M_{c\text{-}pre} = 0.85$, $SD = 0.46$). In the group and measurement time posttest conditions, the effect values in the control group posttest were slightly larger than those in the experimental group posttest, and the results of the experimental and control group posttests showed no too significant differences between the two groups, $F(1, 59) = 0.59$, $p = 0.45$, $\eta_p^2 = 0.01$ ($M_{e\text{-}post} = 0.55$, $SD = 0.35$, $M_{c\text{-}post} = 0.62$, $SD = 0.32$). Under the conditions of group and measurement time tracking tests, the effect values of the control group tracking tests were significantly larger than those of the experimental group tracking tests, and the results of the experimental and control group tracking tests differed significantly, $F(1, 59) = 22.82$, $p < 0.001$, $\eta_p^2 = 0.28$ ($M_{e\text{-}tra} = 0.38$, $SD = 0.29$, $M_{c\text{-}tra} = 0.75$, $SD = 0.30$). It shows that the experimental group has better retention of the training effect and can effectively reach 6 days (See **Figure 7**).

Discussion

Experiment 2b further compared the study methods on the basis of Experiment 2a to test whether the effects of the intervention training could be maintained for a longer period. We therefore increased the number of training tasks for the experimental group (multiple tasks) and the control group (single tasks) based on Experiment 2a. The results of Experiment 2b found no significant difference between the experimental and control groups on the pre- and postmeasures, a result consistent with Experiment 2a, that is, there was no immediate effect. However, after the addition of the training task, the results of the comparison between the two tracking tests and their pretest revealed that the comparison was not significant for the control group, while the opposite was true for the experimental group, indicating that the experimental group had better retention of the intervention training, which lasted for 6 days, while the control group had poorer retention and faded after 72 h.

GENERAL DISCUSSION

The purpose of this study was to investigate the effect of counter-stereotypes cognitive intervention training on aging stereotypes in 12- to 13-year-old adolescents. Three experiments were conducted to verify whether counter-stereotypes cognitive intervention training could effectively weaken adolescents' aging stereotypes and whether the training effects could be maintained for a longer period by increasing the number of intervention training tasks and the number of training sessions.

The results of Experiment 1 showed that the subjects in the experimental group effectively weakened their age stereotypes through the intervention training compared to the control group. Experiment 1 was designed to validate the results of previous studies and also to verify the effect of age factor on the effect of intervention training. Levy et al. (2009) suggested that the formation of age stereotypes begins in childhood and continues to be internalized as we age, remaining in place until old age. Gonzalez et al. (2017) conducted intervention training with adolescent children aged 5–13 years and showed that children aged 10 years and older were most prominently affected by the intervention training. Therefore, the subject group recruited in this study was adolescents between 12 and 13 years of age, and the effect retention effect of the intervention training was consistent with the results of previous studies using adult subjects, that is, the effect of performing a single intervention training was maintained for a few hours or days at most. Such results suggest that although adolescents are indeed better than adults in terms of cognitive plasticity, it is

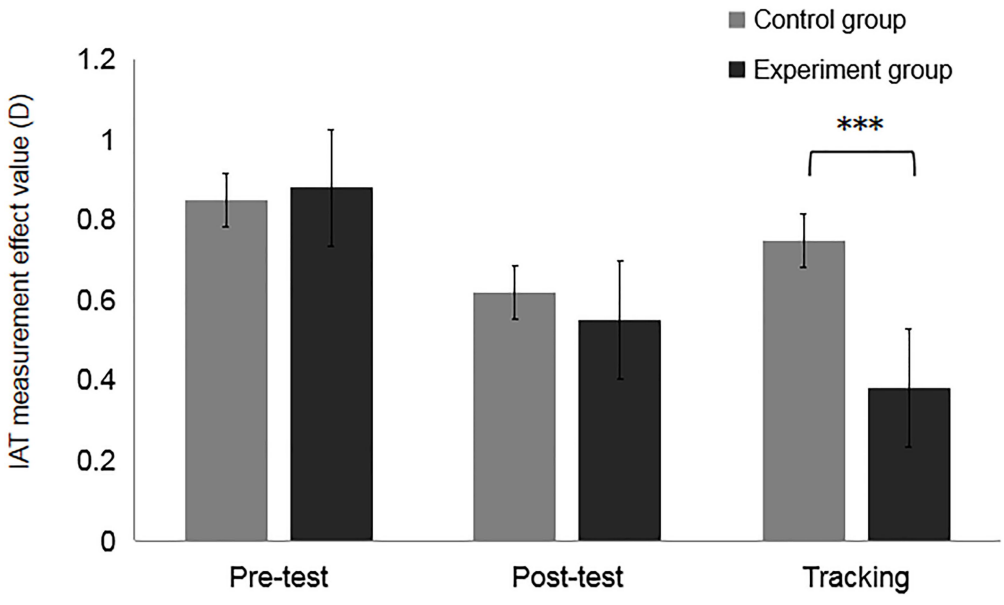

FIGURE 7 | Results of the measurement of the effect value of training effect (D) for different groups, ***$p < 0.05$.

difficult to effectively promote the maintenance of intervention training effects after only a simple and limited number of training sessions, and therefore, further improvements should be made in the intervention training methods and the number of intervention training sessions.

Experiment 2a further explored the effect of counter-stereotypes intervention training on age stereotypes on the basis of Experiment 1. Comparing previous studies, it was found that the effect of counter-stereotypes intervention training had better effect in the short term, but the effect of intervention training was poorly maintained, which may be related to the single training method used in previous studies. Therefore, in Experiment 2a, we added a new intervention training task and also tested whether the addition of the intervention training task and the use of the new intervention training modality could effectively promote the maintenance of the intervention training effect. The results of the study showed that while there was no significant difference between the experimental and control groups on the posttest, there was a significant difference in the results of the follow-up test after 72 h. That is, multiple training tasks are more conducive to the maintenance of intervention effects compared to single-task intervention training. This may be related to the fact that the subjects we recruited developed positive emotions toward the material in the experiment. Most of the subjects recruited for the study were left-behind children raised by older adults, whose emotional experiences led the subjects to be more likely to have positive emotions about the materials in the experiment. In contrast, the use of text plus video in the multiple training produced better positive effects than that produced by the single training, so that the results of the follow-up test after 72 h differed significantly between the control and experimental groups. However, due to the high number of training tasks on that day, the fatigue effect caused the effect of the posttest not to be fully reflected.

Experiment 2b further validated the specific retention effect of intervention training by increasing the number of intervention training sessions on the basis of Experiment 2a. The results showed that there was no difference between the pre- and posttest results of the experimental and control groups. However, the results of the follow-up test showed a significant difference between the experimental and control groups after a second intervention training and again after an interval of 72 h. The results of the comparison between the two groups of the follow-up test and their pretests revealed that the control group did not have significant comparison results, while the opposite was true for the experimental group. This suggests that using a single training task and simply increasing the number of intervention sessions is not good enough to improve the retention of training effects. The retention effect of the intervention training in the experimental group was maintained for 72 h, mainly because the intervention training task used was a combination of the intervention training tasks used in previous studies, and a new task, counter-stereotypes scenarios, was added to the previous intervention training tasks. The use of video for intervention training allows subjects to feel more engaged and can positively influence them from multiple channels (Dasgupta and Greenwald, 2001; Marini et al., 2012; Meijs et al., 2015). On the other hand, the counter-stereotypes scenario uses video material related to the positive aspects of older adults, and the subjects have already associated the positive words in the intervention training material with older adults when completing the intervention training task, and after continuous matching and responding, the subjects have formed relevant links. And the video material used coincided with the positive aspects of older adults, so that subjects maintained better effects on the training task after completing all tasks even though the interval was longer than when only a single task was used in the control group.

The theoretical contributions of this study are mainly in the following areas. First, this study found that the tracking test results of multiple training methods differed significantly from those of single training methods, meaning that multiple training methods performed better than single training methods in terms of retention of training effects. This finding complements previous research on counter-stereotypes intervention training to alleviate aging stereotypes and further explores the best training modality to intervene with aging stereotypes. Second, the results of this study demonstrated that the counter-stereotypes intervention was also effective for adolescents aged 12 to 13 years, which expands the age range of the counter-stereotypes intervention.

This paper also provides some practical implications by verifying the effect of counter-stereotypes intervention training on age stereotypes and the retention effect of the intervention training effect. Combined with the results of this study, we can use the intervention method similar to counter-stereotypes scenario story method in our daily life to carry out unconscious intervention and interstitial reinforcement, such as using TV and online media, broadcasting some representative public service announcements, or offering some related activities in the seventh grade of secondary school, so as to enhance the public's understanding of age stereotypes. At the same time, regions that have the conditions can organize regular activities for children of 12- to 13-year-olds to care for the older adults, such as regular visits to older adults' homes or going into the community to accompany the older adults.

Although the present study provides further evidence for research related to counter-stereotypes cognitive training in mitigating aging stereotypes, some gaps remain in this study and future research could be conducted in the following areas. First, the sample size of the subjects was relatively small, concentrated in remote areas, and some of the samples were left-behind children, so the sample was not representative enough. Therefore, the next study could expand the validity and generalizability of the results by selecting adolescents from different regions to test the sample size. Second, in the IAT measurement process, both the control group and the experimental group need to conduct pre and posttests as well as follow-up tests, so there is a practice effect. Although all the trials in our experimental measurement procedure are presented randomly, there is still a certain practice effect, and we also found that too many trials in the IAT can cause subject fatigue and thus make the measurement results inaccurate, so the duration of the measurement procedure should be adjusted appropriately in future studies. Third, this study did not include data from adults, and follow-up studies should add adult subjects as a reference group to further verify the effectiveness of counter-stereotypes cognitive training in mitigating aging stereotypes in

child subjects. Fourth, the arousal of the video material in Experiment 2a and 2b was 7.23, which may be significantly higher than the median value (5), and the arousal test of the video material in the follow-up study should add a pre- and posttest of subjects' emotions to test whether the effect of counter-stereotypes stories is caused by emotional arousal.

CONCLUSION

The study explored the effects of counter-stereotypes cognitive training on the effects of aging stereotype in adolescents and compared the effects of thee dual and single intervention training on the aging stereotype and its maintenance effect. The results showed that evaluative conditioning can effectively weaken aging stereotypes in 12- to 13-year-olds. However, the retention effect was poor. Compared with a single training task, the effect of a dual-task was better, and the intervention effect was maintained for longer when the training frequency of the dual-task was increased.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s), and minor(s)' legal guardian/next of kin, for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

LC, XZ, SF, LF, and JZ: conceptualization. XZ: methodology, data analysis, and writing original draft preparation. JZ and XZ: software. LC, XZ, and LF: validation. XZ and LF: investigation. LF: original draft confirmation and submission. SF: write and revise all review comments, refine theory and data supplementation, and submit final version of manuscript. LC: project administration. All authors contributed to the article and approved the submitted version.

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The Relationship Between Gender Self-Stereotyping and Life Satisfaction: The Mediation Role of Relational Self-Esteem and Personal Self-Esteem

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Individuals voluntarily internalize gender stereotypes and present personality characteristics and behaviors that conform to gender role requirements. The aim of the current study was to explore the reasons people internalize gender stereotypes. We conducted surveys with 317 college students in China to examine the relationship between gender self-stereotyping and life satisfaction. We also analyzed the mediating roles of relational self-esteem (RSE) and personal self-esteem (PSE) and the moderation role of gender. The results of path analysis showed that gender self-stereotyping directly affected life satisfaction and indirectly affected life satisfaction through RSE and PSE in a serial pattern; however, the serial mediation model was only significant in the male sample. Higher gender self-stereotyping was associated with male participants' higher level of RSE and PSE and further correlated with higher life satisfaction. This study addressed the questions: "What are the benefits of gender self-stereotyping?" and "What are the major barriers to counter-stereotyping?" The results enrich our understanding of these issues, especially relative to the collectivist culture in China, and may be used to create more effective interventions to help people break through the stereotypes.

Keywords: self-stereotyping, gender stereotype, relational self-esteem, life satisfaction, personal self-esteem

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INTRODUCTION

Many films and television shows in China portray grandmother figure who favor boy grandchild over girl grandchild. Although the grandmothers had themselves been victims of the traditional gender idea of "preferring boys to girls," they eventually came to support that notion. Why is the influence of traditional gender ideas so profound? Why do people spontaneously fit into social roles, even when the social role is that of a socially disadvantaged group with low social status and low power (such as the role designated for women in some cultures)? One reason may be that meeting the requirements of social roles and self-stereotyping can induce a series of positive effects, such as improving one's sense of belonging, improving interpersonal relationships, reducing the perception of discrimination, and improving life satisfaction, whereas violating stereotypical expectations

would lead to negative consequences, such as more social pressure and poorer interpersonal relationships (Rudman and Glick, 1999; Brescoll et al., 2010; Hornung et al., 2019; Song and Liu, 2021). Empirical studies have shown that self-stereotyping is positively associated with well-being (Latrofa et al., 2009; Giamo et al., 2012), and women who violate their gender role requirements and appear to have more agency are discriminated against and judged for being "less feminine" (Rudman and Glick, 2001; Brescoll et al., 2010).

The current study focused on the relationship between gender self-stereotyping and life satisfaction and its' mechanisms. The discussion on this issue has important theoretical and practical significance. The empirical research results can help us expand the self-categorization theory and social identity theory, gain a better understanding of why people voluntarily engage in gender self-stereotyping, and clarify the barriers preventing people from violating gender roles. Moreover, the results could be useful for improving or creating intervention methods to help free people from the constraints of gender stereotypes and further pursue self-realization.

BACKGROUND

The Relationship Between Self-Stereotyping and Life Satisfaction

Self-stereotyping refers to a process by which people who belong to a stigmatized social group tend to describe themselves as having more stereotypical ingroup personality traits than non-stereotypical traits (Latrofa et al., 2009). In a broader definition, it is a process in which individuals integrate the stereotypes of the ingroup into their self-concept; this occurs for both those in the stigmatized social group and those in the advantaged social group (Becca, 1996, 2003; Biernat et al., 1996; Chiu et al., 2016). Self-categorization theory (Turner et al., 1987) holds that group members assimilating their attitudes and behaviors to the characteristic of the ingroup leads to attitude polarization between the two groups in contention (Han and Federico, 2018; Mason and Wronski, 2018). Self-classification actuates a group identity and activates group stereotypes (Turner et al., 1987). Moreover, stereotypes act as gender identity norms that affect a person's view of themselves, thus leading individuals to present corresponding personality traits and behavioral responses according to the norms of the inner group (Smith et al., 2021). For example, due to the influence of gender roles and gender stereotypes, many women have long hair, are family oriented, have feminine personality traits (tenderness and virtue), and prioritize occupations considered appropriate for the gender group (nursing and elementary school teacher) (Smith and Parrotta, 2018; Nielsen and Madsen, 2019; Duchin et al., 2020; Smith et al., 2021).

Several studies on self-stereotyping have shown the specificity of this process for disadvantaged group members relative to privileged groups (Pickett et al., 2002; Guimond et al., 2006). According to the rejection-identification model (Branscombe et al., 1999; Latrofa et al., 2009), when individuals perceive the rejection attitude or discriminatory behavior from outgroup members, their ingroup identification might alleviate the negative impact of discrimination on mental health. Thus, discrimination from outgroups unexpectedly leads individuals to favor and protect the unity of the disadvantaged ingroup, increasing gender identity and self-stereotyping as a compensating strategy that satisfies a need to feel accepted.

Life satisfaction involves individual's evaluation of their own life in terms of satisfaction; it is a key component of subjective well-being and is significantly correlated with individual's mental health status (Song et al., 2018). In the current study, we intended to analyze the relationship between gender self-stereotyping and life satisfaction. Previous studies have focused mainly on group identity's relationship to individual psychological and behavioral performance (Barker, 2009). While group identity is an important indicator of people's willingness to internalize group stereotypes, self-stereotyping is a more direct indicator to determine whether individuals internalize gender stereotypes. Meanwhile, it has been directly demonstrated that racial self-stereotyping is positively correlated with life satisfaction (Latrofa et al., 2009; Giamo et al., 2012), but, to our knowledge, the relationship between gender self-stereotyping and life satisfaction has not been analyzed directly. Individuals with a high degree of self-stereotyping are more in line with social rules and social requirements, have a high possibility of interpersonal acceptance (Nielson et al., 2020) and interpersonal harmony (Lei et al., 2017), and experience more happiness (Latrofa et al., 2009). On the other hand, individuals with a low degree of self-stereotyping experience negative social evaluation (Seddig, 2020). Moreover, the positive relationship between self-stereotyping and life satisfaction has been verified for the Western population (Latrofa et al., 2009; Giamo et al., 2012). However, compared to those in more individualistic cultures, people in China's collectivist culture may be more likely to voluntarily internalize gender stereotypes into self-concepts, while counter-stereotypes might face much more social pressure. Thus, it is still necessary to focus on Chinese and analyze the relationship between gender self-stereotyping and life satisfaction. Therefore, in the current study, we sought to explore the relationship between gender self-stereotyping and life satisfaction among Chinese participants and examine its mechanism. We hypothesized that gender self-stereotyping is positively associated with Chinese' life satisfaction (H1).

The Mediation Role of Personal Self-Esteem in the Relationship Between Gender Self-Stereotyping and Life Satisfaction

There is a lack of research exploring the mechanism by which gender self-stereotyping affects life satisfaction. The mediating role of self-esteem in the relationship between self-stereotyping and life satisfaction could be explained theoretically. Self-esteem includes many types, and different types of self-esteem reflect various sources of self-worth. Therefore, it is necessary to pay attention to the different types of self-esteem and their mediation role in the relationship between gender self-stereotyping and life satisfaction.

Self-concept includes the individual self, relational self, and collective self (Tajfel, 1982; Crocker and Luhtanen, 1990; Luhtanen and Crocker, 1992; Brewer and Gardner, 1996). Self-esteem also contains personal self-esteem (PSE), relational self-esteem (RSE), and collective self-esteem (CSE). The first, PSE, refers to the self-worth obtained from differentiated and individuated self-concept which emphasizes one's uniqueness; it is closely associated with self-evaluation about personal attributes, such as competence, talent, and value (Tian, 2006); RSE refers to the self-worth obtained from the connections with significant others, such as family and friends (Du et al., 2012). Finally, CSE refers to individual's evaluation and feeling of the importance of the group they belong to; group identity and intergroup interaction are important sources of CSE (Du et al., 2017).

Previous studies have found that self-stereotyping is positively correlated with CSE (Biernat et al., 1996; Oswald and Lindstedt, 2006). Individuals with high gender self-stereotyping internalize the stereotype characteristics of gender groups as their own personal characteristics, and gender identity becomes an important source of self-identity.

Gender self-stereotyping is also closely associated with PSE. According to self-categorization theory, self-stereotyping occurs on all group relevant attributes or dimensions (Turner et al., 1987). Thus, positive gender stereotypes can promote self-esteem (Oswald and Lindstedt, 2006). However, the internalization of negative group stereotypes may threaten one's social identity and lead to a reduction in PSE (Katz et al., 2002). For the disadvantaged female group, internalization of the lesser value that women hold in society might lead to their negative personal evaluation of self, and it has been documented that girl begins to demonstrate lower PSE than do boy in adolescence (Katz et al., 2002).

Furthermore, social identity theory holds that people strive to maintain a positive social identity (Tajfel, 1982). Therefore, positive gender stereotypes are easily integrated with the self-concept and promote positive PSE. However, it is not clear how individuals can internalize negative stereotypes yet maintain positive self-evaluations. We surmised that there might be three ways that this can happen: (1) People endorse negative stereotypes as more "group-descriptive" than "self-descriptive" (Oswald and Lindstedt, 2006). (2) People ignore the negative aspects of group stereotypes. (3) People perceive negative stereotypes as unimportant and valueless for their future (e.g., low task value; for example, there are stereotypes about females being less capable or proficient than males in mathematics, but some females may think mathematics is not important for them; Song et al., 2017). Thus, we hypothesized that self-stereotyping is generally positively associated with PSE (H2a).

Moreover, PSE is a direct factor that affects people's well-being. Many studies have documented that self-esteem plays a positive role by enhancing well-being (Quevedo and Abella, 2011; Douglass and Duffy, 2015; Yao et al., 2016). The cognitive model of depression suggests that related negative self-schemas, including feelings of worthlessness, failure, and low self-esteem, constitute a cognitive susceptibility to depression, whereas positive perceptions of self-schemas lead to high life satisfaction (Beck, 2008). Thus, we hypothesized that PSE is positively associated with life satisfaction (H2b), and PSE plays a mediating role in the relationship between gender self-stereotyping and Chinese' life satisfaction (H2).

The Mediation Role of Relational Self-Esteem in the Relationship Between Gender Self-Stereotyping and Life Satisfaction

There are few studies that have directly analyzed the relationship between self-stereotyping and RSE. We speculated that individuals with a high degree of gender self-stereotyping would be much more accepted by parents, family, teachers, and society than those with low gender self-stereotyping because they are more likely to meet the requirements of social norms and expectations of significant others. Alternatively, a counter-stereotypical individual might be at greater risk for interpersonal rejection. Researchers have reported that women who exhibit non-stereotypical traits and do not conform to ascribed gender roles are perceived as being more competent and having more agency than the stereotypical women (Song and Liu, 2021), yet are still more negatively evaluated at work compared to men (Brescoll and Uhlmann, 2008). Counter-stereotyped women are often perceived as interpersonally deficient (Rudman and Glick, 1999), insufficiently "nice" (Brescoll et al., 2010), and less feminine, and they are often not welcomed by their male counterparts (Song et al., 2017; Song and Liu, 2021), compared to stereotyped women. Meanwhile, counter-stereotypical men can be perceived even more negatively than counter-stereotypical women (Levy et al., 1995; Blakemore and Russ, 1997; Ed Ucational, 1999; Rudman and Mescher, 2013; Vandello et al., 2013). Some media advocate men having masculine characteristics and criticize male entertainers who use heavy makeup, wear sexy clothes, or appear as gender-confused figures. Men who have prominent "feminine traits" or engage in female-dominated fields are viewed as less competent, weak, abnormal, incapable of leadership, and less desirable as potential partners (Brescoll and Uhlmann, 2005; Wen et al., 2020). Counter-stereotyped men would face low social acceptance in present-day China, and the affirmation and acceptance of significant others are important sources of RSE. Therefore, we hypothesized that gender self-stereotyping is positively correlated with RSE (H3a).

Furthermore, a study found that there was a positive correlation between RSE and life satisfaction (Wagner, 2009). Du et al. (2014) showed that RSE was positively associated with multiple indicators of psychological well-being, and both family-related and friend-related RSEs were important to well-being. Du et al. (2017) further compared the predictive effects of RSE, PSE, and CSE on psychological well-being through four cross-sectional studies and one longitudinal study. The results showed that, when controlling for PSE, RSE was associated with greater life satisfaction, positive affect, meaning in life, happiness, and subjective vitality. Therefore, we speculated that RSE is positively associated with life satisfaction (H3b), and RSE might

play a mediating role in the relationship between gender self-stereotyping and life satisfaction (H3).

Previous studies have shown a positive correlation between PSE and RSE (Du et al., 2015). Perceived relational evaluation, or the extent to which people see others as valuing them, is a particularly significant determinant of self-esteem (Norman et al., 2012). Additionally, positive evaluations from others who are considered "important" can lead improve an individual's sense of self-worth and induce higher competence self-evaluation. In summary, we speculated that RSE was positively associated with PSE (H4), and thus, gender self-stereotyping could indirectly affect life satisfaction through RSE and PSE in a serial pattern.

Current Study

As described above, self-stereotyping has shown the specificity of this process for disadvantaged group members relative to privileged groups (Pickett et al., 2002; Guimond et al., 2006). Therefore, the effect of self-stereotyping on females' life satisfaction, RSE, and PSE seems much higher than for males and that the mediation model would be moderated by gender. However, other studies indirectly showed that males face higher social pressure of self-stereotyping than females. The social acceptance toward counter-stereotypical males was lower than counter-stereotypical females (Levy et al., 1995; Blakemore and Russ, 1997; Ed Ucational, 1999; Vandello et al., 2013). It has been demonstrated that boys' gender-role violations involving physical appearance would be judged to be more serious than similar transgressions by girls (Levy et al., 1995; Blakemore and Russ, 1997). For the gender-role violation involving family/work oriented, previous research also inferred men who seek work flexibility may be particularly penalized (e.g., being demoted or downsized) and interpersonal stigmatized compared with women who seek work flexibility (Wayne and Cordeiro, 2003; Butler and Skattebo, 2004; Rudman and Mescher, 2013), as these men were seen as less masculine and rated lower on masculine prescriptive traits and higher on feminine prescriptive traits (Rudman and Mescher, 2013; Vandello et al., 2013). Thus, we could also inference that the effect of gender self-stereotyping on males' life satisfaction, RSE, and PSE seems much higher than for females. As the contrary results in previous research, we made exploratory research and hypothesized that the serial mediation model would be significantly different in the female sample compared with that in the male sample (H5) and gender plays a moderation role in the serial mediation model.

The purpose of the current study was to analyze the direct effect of self-stereotyping on life satisfaction, the indirect effect through PSE and RSE in a serial pattern, and the moderation role of gender. To analyze the mediation role of RSE and PSE, we conducted a serial multivariable mediation (Hayes, 2013); the self-stereotyping was assumed to influence life satisfaction through three specific indirect effects: through PSE (H2), through RSE (H3), and through both RSE and PSE (H4). Moreover, to analyze the moderation role of gender in the serial mediation model (H5), we analyzed the serial mediation model in male and female samples; the difference between these two serial mediation models indicates the significance of the moderating role of gender.

MATERIALS AND METHODS

Participants

A total of 328 college students from a university in Wuhan participated in this investigation; 317 valid questionnaires were collected, including 171 men (53.82%) and 146 women (46.18%); 127 in rural areas (40.1%) and 190 in urban areas (59.9%). The age of the participants was ranged from 17 to 26 years old (M = 18.36, SD = 1.11). For the subjective family economic situation, one participant perceived him/her as very poor (0.3%), 25 participants perceived them as a little poor (7.9%), 220 as average (69.4%), 66 as a little rich (20.8%), and five as very rich (1.6%).

Questionnaire

Gender Self-Stereotyping

Gender self-stereotyping refers to the extent to which people attribute relevant group characteristics, both positive and negative, to the self (Latrofa et al., 2009). It was measured through the evaluation similarity between self and ingroup. Participants both rated self and their gender ingroup on 22 personality traits: 11 male trait words (brave, rational, competence, efficient, work-oriented, good at science and engineering, like video games, reckless, impulsive, aggressive, and careless), and 11 female trait words (gentle, emotional, warmth, kind, family oriented, good at humanities, like shopping, timid, sensitive, fragile, and emotional). We chose these traits words based on previous research (Zhang et al., 2015; Zuo, 2015). The degree of I/female or I/male have these traits was assessed on a scale from 1 = none to 7 = very much. For each participant, we could get 22 rating scores describing themselves and the 22 rating scores describing their ingroup. When calculating the self-stereotyping for female participants, the 11 male trait words were reverse-scored; when calculating the self-stereotyping for male participants, the 11 female trait words were reverse-scored.

The self-stereotyping indices for each participant were obtained by calculating correlations between self and ingroup ratings with the following equation:

$$r = \sum_{i=1}^{n} (X_i - \overline{X})(Y_i - \overline{Y}) / \sqrt{\sum_{i=1}^{n} (X_i - \overline{X})^2} \sqrt{\sum_{i=1}^{n} (Y_i - \overline{Y})^2}$$

The higher the correlation between evaluation on self and ingroup, the higher the degree of gender self-stereotyping. This method of measuring self-stereotyping has been used in previous studies and has been demonstrated to be effective (Latrofa et al., 2012). In the current study, the Cronbach's alpha coefficient of this measurement was 0.71. For the 22 items of self-evaluation, the confirmatory factor analysis showed that the model had an acceptable fit, CMIN/DF = 3.47, GFI = 0.84, NFI = 0.85, IFI = 0.89, TLI = 0.86, CFI = 0.09, RMSEA = 0.088. For

the 22 items of evaluating ingroup, the confirmatory factor analysis showed that the model also had an acceptable fit, CMIN/DF = 4.50, GFI = 0.81, NFI = 0.84, IFI = 0.87, TLI = 0.82, CFI = 0.87, and RMSEA = 0.10.

Relational Self-Esteem

Relational self-esteem scale was used to measure the RSE (Du et al., 2012); this scale included eight items (in general, I am glad to become a member in my circle of friends); four-point rating scale was used, with 1 = strongly disagree, 4 = strongly agree. The higher score indicated high RSE. In the current study, the Cronbach's alpha coefficient was 0.88.

Personal Self-Esteem

Personal self-esteem (PSE) was measured by the 10-item Rosenberg Self-Esteem Scale (Wang et al., 1999). For example, I have a positive attitude toward myself. One item (the eighth item: I wish I could have more respect for myself) was removed because of its low validity in Chinese samples (Tian, 2006; Chen et al., 2013). Items were rated on a four-point Likert scale (1 = strongly disagree, 4 = strongly agree). Higher scores indicated higher PSE. This scale's internal consistency was good in the current sample (Cronbach's alpha = 0.87).

Life Satisfaction

Life satisfaction was assessed by the Chinese version of the Student's Life Satisfaction Scale (Huebner, 1991). Participants rated seven items (e.g., my life is going well) on a six-point Likert scale (1 = low, 6 = high). Higher scores indicated higher levels of life satisfaction. This Chinese version scale has been widely used (e.g., Hou et al., 2009). This scale's internal consistency was good in the current sample (Cronbach's alpha = 0.80).

Procedure

Permission to conduct the study was granted by the Research Ethics Committee at the institution with which the first author was affiliated. College students voluntarily scanned the QR code and filled in the online questionnaire. First, the purpose and requirements of the study were explained, and then participants gave written informed consent to participate. Moreover, participants answered the questionnaire of self-stereotyping, PSE, RSE, and life satisfaction. When the study was complete, the participants were given a small reward (random red packet, from one to three CNY) to thank them for their help.

RESULTS

Descriptive Statistics and Correlation Analyses

As shown in **Table 1**, gender self-stereotyping was positively related to PSE, RSE, and life satisfaction. Both PSE and RSE were positively related to life satisfaction. In order to avoid common methodological deviations, the Harman single factor method was used; the results showed that the first factor explained a variation of 17.84%, which was less than the 40% critical value. Therefore, the influence of common method deviation on the results of this study can be excluded (Zhou and Long, 2004).

TABLE 1 | Means, standard deviations, and Pearson's correlations among all variables.

	M	*SD*	1	2	3	4	5
1 Self-stereotyping	0.39	0.30	1				
2 PSE	27.36	4.66	0.19**	1			
3 RSE	25.39	4.18	0.17**	0.63***	1		
4 Life satisfaction	28.01	5.52	0.21**	0.57***	0.53***	1	
5 Gender	0.54	0.50	0.25**	0.03	−0.01	−0.02	1

*N = 317. **p < 0.01 and ***p < 0.001. Gender was a dummy variable, with male = 1 and female = 0. M (gender) referred to the proportion of male in all participants. The correlation coefficient between gender and self-stereotyping was positive indicating that the male has a higher level of self-stereotyping compared with female participants.*

Mediation Role of Personal Self-Esteem and Relational Self-Esteem

We used Hayes's (2013) PROCESS macro (Model 6) to examine the serial mediation model. Moreover, as previous research has generally shown that people belonging to numerical or status minorities are more likely than majority members to ascribe stereotypic characteristics to the self. Thus, gender was used as control variables in the mediation effect model (Guimond et al., 2006). In addition, we also controlled the age in the mediation effect. We used bias-corrected percentile bootstrap method with 5000 bootstrap samples to calculate the indirect effect. The indirect effect was significant at $p = 0.05$ if the 95% confidence interval didn't include 0 (Erceghurn and Mirosevich, 2008).

As shown in **Table 2**, gender self-stereotyping was a significant positive predictor of RSE ($\beta = 0.18$, $p < 0.001$) and life satisfaction ($\beta = 0.10$, $p < 0.05$). The results also showed that RSE was positively associated with PSE ($\beta = 0.62$, $p < 0.001$) and life satisfaction ($\beta = 0.27$, $p < 0.001$); PSE was positively associated with life satisfaction ($\beta = 0.38$, $p < 0.001$).

The mediation analysis with bias-corrected percentile bootstrap method showed that the total indirect effects of gender self-stereotyping on life satisfaction via PSE and RSE were significant and the total indirect effect was 0.12. As shown in **Table 3**, the mediation role of RSE in the relationship between gender self-stereotyping and life satisfaction was significant (H2 was supported), the serial mediation role of RSE and PSE was also significant (H4 was supported), but the mediation role of PSE was not significant (H3 was not supported).

The Moderation Role of Gender

As the gender might moderate the serial mediation model, thus, we also analyzed the serial mediation model in male and female samples, respectively. For the female participants, in the model of self-stereotyping that affected the RSE, the self-stereotyping was not associated with RSE ($\beta = -0.001$, $p = 0.99$). In the model of self-stereotyping and RSE affected PSE, self-stereotyping was not significantly associated with PSE ($\beta = 0.05$, $p = 0.43$), and RSE was positively associated with PSE ($\beta = 0.69$, $p < 0.001$). In the model of self-stereotyping, RSE, and PSE affected the life satisfaction, all these three variables were positively associated with life satisfaction ($\beta = 0.21$, $p < 0.01$; $\beta = 0.34$, $p < 0.001$; $\beta = 0.34$,

TABLE 2 | Regression results for the serial mediation model.

Dependent variables	Independent variables	*R*	R^2	*F*	β	*t*
RSE	Self-stereotyping	0.24	0.06	6.52***	0.18	3.26***
	Gender				−0.09	−1.62
	Age				−0.16	−2.87**
PSE	Self-stereotyping	0.64	0.41	53.93***	0.08	1.69
	RSE				0.62	13.96***
	Gender				0.02	0.50
	Age				0.04	0.93
Life satisfaction	Self-stereotyping	0.62	0.38	38.06***	0.10	2.18*
	RSE				0.27	4.56***
	PSE				0.38	6.49***
	Gender				−0.06	−1.23
	Age				−0.02	−0.44

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

TABLE 3 | Indirect effects and 95% CIs for the mediational model.

	Effect	Boot SE	Boot LLCI	Boot ULCI
Direct effect	0.10	0.05	0.01	0.19
Total indirect effect	0.12	0.03	0.06	0.19
Indirect effect via RSE	0.05	0.02	0.01	0.09
Indirect effect via PSE	0.03	0.02	−0.01	0.06
Serial indirect effect	0.04	0.02	0.01	0.08

$p < 0.001$). Moreover, the mediation effect analysis showed that the total indirect effect of self-stereotyping on life satisfaction was not significant (*B* = 0.02, *LLCI* = -0.12, *ULCL* = 0.14), the mediation effect of RSE and PSE was also not significant (*B* = -0.0004, *LLCI* = -0.08, *ULCL* = 0.07; *B* = 0.02, *LLCI* = -0.04, *ULCL* = 0.07), and the serial mediation effect of PSE and PSE was not significant (*B* = -0.0003, *LLCI* = -0.05, *ULCL* = 0.05).

For the male participants, in the model of self-stereotyping that affected the RSE, the self-stereotyping was positively associated with RSE (β = 0.33, $p < 0.001$). In the model of self-stereotyping and RSE affected PSE, self-stereotyping was not significantly associated with PSE (β = 0.11, $p = 0.08$), and RSE was positively associated with PSE (β = 0.56, $p < 0.001$). In the model of self-stereotyping, RSE and PSE affected the life satisfaction, self-stereotyping was not associated with the life satisfaction (β = 0.01, $p = 0.85$), and RSE and PSE was positively associated life satisfaction (β = 0.23, $p < 0.01$; β = 0.42, $p < 0.001$). Moreover, the mediation effect analysis showed that the total indirect effect of self-stereotyping on life satisfaction was significant (*B* = 0.19, *LLCI* = 0.11, *ULCL* = 0.29), the mediation effect of RSE was significant (*B* = 0.07, *LLCI* = 0.01, *ULCL* = 0.15), the mediation effect of PSE was not significant (*B* = 0.04, *LLCI* = -0.003, *ULCL* = 0.10), and the serial mediation effect of RSE and PSE was significant (*B* = 0.07, *LLCI* = 0.03, *ULCL* = 0.13). In summary, the serial mediation effect of RSE and PSE in the relationship between gender self-stereotyping and life satisfaction was only significant in the male participants, the moderation role of gender was supported.

DISCUSSION

The current study explored the relationship between gender self-stereotyping on life satisfaction and its mechanism. The results showed that gender self-stereotyping not only directly promoted life satisfaction but also indirectly affected life satisfaction through the serial mediation role of RSE and PSE. Moreover, the serial mediation effect of RSE and PSE was only significant in the male sample. This study expanded previous research in the following aspects. First, previous research analyzed the relationship between the group identity and psychological and behavioral outcomes; we focused on the direct impact of self-stereotyping on life satisfaction. Compared with group identity, self-stereotyping is a variable that could directly reflect how strongly group stereotypes have been internalized. Second, previous studies have explored the relationship between racial self-stereotyping and life satisfaction (Latrofa et al., 2009), while our study focused on gender self-stereotyping. Third, we verified the existence of a relationship between gender self-stereotyping and life satisfaction in China. Fourth, our study systematically revealed the internal mechanism of gender self-stereotyping affected life satisfaction and analyzed the mediation role of PSE and RSE. Fifth, we also analyzed the moderation role of gender; the results indicated that the self-stereotyping process only leads to male participants having high RSE, which further leads to high PSE and high life satisfaction. Counter-gender stereotypical male might experience high social pressure and low social acceptance compared with counter-gender stereotypical female. This has been verified in a Western country long before (Levy et al., 1995; Blakemore and Russ, 1997; Ed Ucational, 1999; Rudman and Mescher, 2013; Vandello et al., 2013). We constructively and repeatedly verified this result in China samples.

The Relationship Between Gender Self-Stereotyping and Life Satisfaction

This study found a significant positive correlation between gender self-stereotyping and life satisfaction, which is consistent with previous research (Latrofa et al., 2009). Our results also show that when individuals meet social requirements and integrate group identity into their self-concept, their life satisfaction increases. The self-stereotyping process might involve a risk of people identifying negative characteristics of their ingroup, further leading to lower self-evaluation. However, it can also create gains to ingroup identity and group belonging. Self-stereotyping individuals are more likely to be recognized and accepted by the ingroup and outgroup members, and thus they might have higher life satisfaction. Individuals who present low levels of self-stereotyping, possessing personality characteristics and behaviors in violation of gender role requirements, have a higher possibility of experiencing social exclusion and more interpersonal pressure, resulting in lower life satisfaction. Therefore, the social role deviation needs to pay a

substantial social cost, and thus counter-stereotype might reduce life satisfaction.

The Mediation Role of Personal Self-Esteem and Relational Self-Esteem

The results also showed that gender self-stereotyping can indirectly affect life satisfaction through RSE. People with a higher degree of gender self-stereotyping conform more than others to the social expectations around their gender role; they may also conform to the social expectations of "important others." Thus, there is a high possibility that such individuals experience good interpersonal relationships and high RSE. For example, women who internalize gender roles would exhibit typical feminized characteristics and try to be good mothers and wives. They are more family oriented, care about and value their family more than work and self-actualization, and could derive self-esteem from family relationships. However, females who exhibit masculine characteristics or are successful in traditional male roles were often negatively evaluated and need to face more social exclusion. Career success might even make them less sexually attractive to men, reduce their commitment to their family; this might lead them to have a high possibility of low RSE. Therefore, there was a positive correlation between self-stereotyping and RSE.

The mediation effect of PSE on the relationship between gender self-stereotyping and life satisfaction was not significant. Gender stereotyping related to females contained positive content (females were good at reading and were gentle, careful, and kind) and negative content (females are not good at STEM; girls have low competence and lack of confidence). The internalization of positive gender stereotypes can promote PSE (Oswald and Lindstedt, 2006), while internalization of negative stereotypes can lower PSE (Katz et al., 2002). These paradoxical results may have resulted in an insignificant relationship between self-stereotyping and self-esteem.

Moreover, gender self-stereotyping can indirectly affect life satisfaction through the serial mediation of RSE and PSE. RSE refers to the self-worth gained from significant others, while PSE refers to the belief and evaluation of one's own abilities and values. Therefore, a high RSE could enhance an individual's sense of self-worth and promote positive self-evaluation. In general, individuals with a high degree of gender self-stereotyping conform to group norms, are in line with the expectations of important others, have higher RSE and PSE, and ultimately experience higher life satisfaction. On the contrary, a low degree of self-stereotyping means violating social expectations and not matching the requirements of social roles, which may lead to less harmonious relationships with family members and others, decrease RSE, reduce PSE, and ultimately lead to lower life satisfaction.

The Moderation Role of Gender

We found that the serial mediation role of RSE and PSE was only significant in the male sample (not in the female sample); thus, the moderation role of gender was supported. Previous research has demonstrated that people from disadvantaged groups are more likely to feel discrimination and prejudice. The disadvantaged group identity (gender, race, etc.) is unchangeable. Identifying ingroup identity and increasing the sense of belonging becomes a protective strategy to alleviate the negative impact of discrimination from outgroup (Pickett et al., 2002; Guimond et al., 2006). Based on the review above, females have a high level of self-stereotyping, and self-stereotyping was more influential in female groups.

However, our study found completely opposite results: Gender self-stereotyping did not improve the females' RSE, but could improve male's RSE, and further improve PSE and life satisfaction. We speculate that this might be because: (1) The Chinese male might face higher social pressure of self-stereotyping than the female. They have to be masculine, and meanwhile, they need to prove that he is not female. A man who deviates from male roles would have a much harder time and experience lower social acceptance than counter-stereotypical female (Levy et al., 1995; Blakemore and Russ, 1997; Ed Ucational, 1999; Rudman and Mescher, 2013; Vandello et al., 2013). Although counter-stereotypical females did not meet the requirements of gender roles, they tend to be much more capable compared to stereotypical females; this change is in line with the social norm of "trying to better oneself and striving for self-realization." However, counter-stereotypical males are considered less capable than the stereotypical male (Brescoll and Uhlmann, 2005; Vandello et al., 2013; Wen et al., 2020); they neither conform to the gender roles nor social norms of "being positive." Therefore, counter-stereotypical males might face greater pressure of social exclusion than counter-stereotypical females, and counter-stereotypes lead to males having low RSE and PSE. (2) Women's social roles have changed over the past quarter-century. Women have entered the labor force at higher rates than ever, have begun to take on the roles traditionally held by men, and are increasingly becoming household breadwinners (Chang et al., 2011, 2017; Lu et al., 2015). As a result, the social stereotypical expectation and requirements toward females also changed. Internalizing the traditional stereotypical female traits is not to conform to the current gender role requirement for females. Thus, the females' gender self-stereotyping degree was lower than males, and the internalization of traditional feminine stereotypes was not associated with females' PSE and RSE.

Implications

Many education experts encouraged people (especially low-valued group, women) to break out of stereotypes, become whomever they want to be, and achieve self-fulfillment. It has been demonstrated that exposure to counter-stereotypic gender role models (Leicht et al., 2014), effectively emotions regulation (Johns et al., 2008), self-affirmation intervention (Wang and Yu, 2017), learn about stereotype threat (Zhang et al., 2014), identity management strategies (Guan et al., 2017) could effectively intervene the negative impact of stereotype. However, these studies ignore the reality that people are actively and voluntarily self-stereotyping. For example, some females actively show that they are not good at STEM and actively choose feminine careers. It is necessary to better answer the questions: Why do people voluntarily

internalize stereotypes and what are the obstacles and pressures to deviate from their social roles.

The current study explained why people voluntarily self-stereotyping. Our results provided empirical support and expanded the self-categorization theory and social identity theory. Our results highlight that conforming to gender stereotypes can have such benefits: could increase females' life satisfaction, could increase males' interpersonal harmony, RSE, and PSE, and ultimately leads to increased well-being. However, counter-stereotyping males face many social and interpersonal pressures and experience low interpersonal support from significant others, leading to low RSE and PSE. Thus, male is more voluntarily self-stereotyping and afraid of deviating from the gender role than female.

Moreover, the purpose of this study is not to encourage self-stereotyping but to find a more effective method to reduce self-stereotyping and break the shackles of stereotypes for social or culturally disadvantaged members (for example, the men are disadvantaged group in verbal expression and engaging in nurse career). Based on our results, we suspected that increasing the social acceptance of counter-stereotype targets are important solutions for men to voluntarily go against gender stereotypes. Men would voluntarily break stereotypes unless society accepts counter-stereotype target. For the female, counter-gender stereotypical female has low life satisfaction compared with high self-stereotyping female. We did not find out its' reason and mechanism in the current study; we suspected it might be family work conflict that reduces counter-gender stereotypical female' life satisfaction, but it still needs to be further confirmed in a future study.

Limitations

This study has limitations that need to be addressed in future studies: (1) it only focuses on RSE and PSE. Future research can also integrate CSE to explore the mediating effect of gender self-stereotyping on life satisfaction. (2) It is necessary to conduct cross-cultural research to compare the cultural differences of self-stereotyping affect life satisfaction. (3) We included both positive and negative personality traits when measuring gender self-stereotyping. This positive stereotype and presentation of double-sided information may have increased gender identity (Alt et al., 2019). Thus, our measure itself may be a priming factor that increases gender identity.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institute of Applied Psychology, China University of Geosciences (Wuhan). The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JS designed the study and wrote the manuscript. JL designed the study, analyzed the data, and wrote the manuscript. YL collected the data. All authors contributed to the article and approved the submitted version.

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frontiers in Psychology

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The Pandemic and the "Perpetual Foreigner": How Threats Posed by the COVID-19 Pandemic Relate to Stereotyping of Asian Americans

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We examined the "othering" of Asian Americans in the context of the COVID-19 pandemic. Given past evidence that pathogen-related threat perceptions can exacerbate intergroup biases, as well as salient public narratives blaming the Chinese for the pandemic, we assessed whether individuals experiencing a greater sense of threat during the pandemic were more likely to apply the "perpetual foreigner" stereotype to Asian Americans. Over a seven-week period, we recruited 1,323 White Americans to complete a measure of the perceived Americanness of Asian, Black, and White targets. Asian targets were consistently perceived as less American than White targets, across variations in subjective health threat and regional case counts. The direct and indirect connections of political ideology to the observed patterns were examined, revealing that White participants who blamed China for the pandemic were more likely to apply the perpetual foreigner stereotype to Asian Americans. These results indicate that the othering of Asian Americans is pervasive among White Americans and that variables related to social conditions surrounding the COVID-19 pandemic can predict the potency of this association.

Keywords: race, Asian Americans, stereotyping, COVID-19, pathogens, cultural foreignness

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INTRODUCTION

Stereotypes held about many social groups are rooted in historical patterns of intergroup relations, particularly patterns reflecting intergroup conflict and groups' relative success and status (e.g., Fiske et al., 2007). Stereotype content often reflects perceptions of intergroup conflict, including both resource competition and conflicting cultural values (Bobo, 1988; Sears and Henry, 2003; for a review, see Bodenhausen and Richeson, 2010). Across time, new conditions emerge that can potentially modulate the content and expression of intergroup biases. For example, Whites' expressions of ethnoracial bias have been tied to fluctuations in economic conditions (Bianchi et al., 2018) and to increases in the size of minority populations (Quillian, 1995; Craig and Richeson, 2014; Zou and Cheryan, 2021). Here, we examined whether the social upheaval associated with the COVID-19 pandemic and the patterns of perceived threat that it has given rise to are associated with changes in the expression of stereotypes about Asian Americans, given the origins of the pandemic in China.

Previous work in the United States has documented two dominant trends in the stereotyping of Asian people. First, they are often perceived as economically successful and admired as a "model minority" (Cheryan and Bodenhausen, 2020), though in fact people tend to substantially underestimate the economic gap between Asian Americans and Whites (Kuo et al., 2020). Second, they are also often viewed as foreign and as not representing cultural Americanness (Cheryan and Monin, 2005; Darling-Hammond et al., 2020). In fact, White Americans tend to perceive "Americanness" and "Whiteness" in very similar ways (Devos and Banaji, 2005; Devos and Heng, 2009), rendering non-White groups inherently less prototypically American. Thus, despite their presumed economic prowess, attributions of foreignness provide a basis for Asian Americans' relative devaluation and subordination (Zou and Cheryan, 2017).

How might the COVID-19 pandemic influence this tendency toward "othering" Asian Americans? Chronic and manipulated pathogen threats have been linked to negative attitudes toward immigrants and people with unfamiliar backgrounds, and they amplify preferences for the (familiar) ingroup over the outgroup (Navarrete and Fessler, 2006; Green et al., 2010; Huang et al., 2011; Wu and Chang, 2012). Fear of uncertain health risks is linked to fear of unfamiliar (or supposedly *foreign*) others (e.g., Faulkner et al., 2004; Kusche and Barker, 2019; see Neuberg and Schaller, 2016). Thus, it is reasonable to hypothesize that pandemic-related fears will be linked to heightened othering of groups that are already viewed as relatively foreign. Anti-Asian sentiment and violence rose with the onset of the COVID-19 pandemic (e.g., Ruiz et al., 2020), especially when fear of the virus was high (Dhanani and Franz, 2020; Mandalaywala et al., 2020). While much of this prior work has emphasized broad, affective outcomes—whether unfamiliar groups are liked—we instead focus on the attribution of foreignness itself. Has COVID-19 pathogen threat impacted the application of the perpetual foreigner stereotype to Asian Americans?

Fears associated with the pandemic may be especially linked to Asians because this particular pathogen emerged in China. The origins of the pandemic in Wuhan suggest that Chinese people might be particularly subjected to heightened ethnoracial stereotyping by those threatened by COVID-19. However, many Americans fail to respect distinctions among different Asian ethnic groups; indeed, one of the most commonly reported microaggressions among Asian Americans is the failure of others to acknowledge ethnic group differences (Sue et al., 2007). To the extent that blame is focused on China, and Asian people more broadly (IPSOS, 2020), White Americans may be especially likely to view Asians as lacking "Americanness." Media coverage of the pandemic, particularly the extent to which references to the virus implicate China (or Asian people more broadly), have been associated with heightened racial antipathies (Noel, 2020; Hswen et al., 2021), including controlled experimental research demonstrating a causal effect of emphasizing the COVID-China link (Dhanani and Franz, 2021). Additionally, supporters of then-President Donald Trump (who strongly emphasized the China-COVID-19 link; Rogers et al., 2020) reported more negative attitudes toward Asian people (Dhanani and Franz, 2020). These findings raise a key theoretical question—do perceptions of an outgroup's foreignness rise as a function of perceived pathogen threat *per se*, or does there need to be an implied connection of the outgroup to the pathogen's origins? Our study directly addresses this question.

MATERIALS AND METHODS

Participants

During the summer of 2020, we recruited 1996 participants using TurkPrime's CloudResearch platform (Litman et al., 2017). Recruitment took place over a seven-week period between June and August. This was a period when US COVID cases had surged again after an initial "flattening of the curve" and were at their highest 7-day average to date. The effects (socially, economically, and with regard to healthcare) of the pandemic were such that many thought that things in the United States might be at their worst stage. For example, US COVID-19 deaths surpassed 100,000, cases surpassed 2 million, and COVID-19 became the third-leading cause of death in the United States (AJMC, 2021).

One hundred and six participants were excluded: 16 said they had not taken the survey seriously, 8 reported different ages, states of residence, or political orientations across different attempts to participate, and 99 provided inauthentic open-ended text responses that were copied from another source; final $N = 1{,}873$. We used sampling quotas to balance representation across geographic and residential variables because of their relevance to the spread of COVID-19, and political ideology because of its psychological relevance to Americans' individual beliefs about COVID-19 (Astor, 2021).

We report analyses with the subset of participants (70.05%, $N = 1{,}312$) who reported their racial/ethnic identity as monoracially White and who indicated their political ideology on the liberal-conservative continuum (60.90% men, 38.80% women, <1% other or no answer; Median education was a Bachelor's degree (54.12%); $M_{age} = 38.05$; $SD_{age} = 11.58$). The sample was roughly balanced with respect to geographic region (23.48% in the Midwest, 20.73% in the Northeast, 35.00% in the South, and 20.81% in the West), residential population density (18.45% rural area, 27.82% small city or town, 31.56% suburb near a large city, 22.18% large city), and political ideology (43.60% liberal, 19.36% moderate, 37.04% conservative). We focused on White respondents because past research (e.g., Cheryan and Monin, 2005) suggests that the "othering" of Asian people is primarily found among White participants. Further, we restricted analyses to those who responded to a question about political ideology, given our intention to control for political ideology in the reported analyses, particularly the analyses that include the extent to which participants report holding China responsible for the pandemic.

Measures

Through an online survey, participants completed a battery of measures assessing their beliefs and attitudes about different racial-ethnic groups residing in the United States. Here, we focus

on two tasks assessing perceived Americanness—a semantic differential questionnaire (e.g., Osgood et al., 1957) and a face-rating task. These variables were studied as a function of participants' characteristics and self-reported experiences during the COVID-19 pandemic in the summer of 2020.

Semantic Differential Measure

Participants were asked to think about *White people who live in the* United States and *Asian people who live in the* United States. For each group, participants choose from three 7-point scales with bipolar endpoints (American-Foreign, Familiar-Unfamiliar, Insider-Outsider). We collapsed across ratings and scaled this variable so that 1 is the most-American possible rating, and −1 is the most-Foreign possible rating ($\alpha_{Asian} = .87$; $\alpha_{White} = .9$).

Face-Rating Task

Participants also completed a face-rating task modeled after Study 1 of Cheryan and Monin (2005). Participants rated target faces for how American, Attractive, and Intelligent they were, with the latter two being fillers. Ratings were collected using a slider ranging from *Not at all/0* to *Extremely/100*; for analysis, the Americanness ratings were rescaled as a −1 to 1 variable, where 1 is Extremely American. Ratings were made for two faces each from eight groups defined by: perceived race (Asian vs. White), perceived gender (man vs. woman), and supposed birthplace of origin (United States vs. non-United States).[1] To use naturalistic faces for the rating task, we chose faces from the 10k face database (Bainbridge et al., 2013), using a combination of the norming data provided by the authors and norming data that we gathered using the same process and population as our main data collection ($N = 170$; $M_{age} = 38.42$ years, $SD_{age} = 11.78$; 61.20% men, 38.2% women, .59% not listed; 77.1% White, 11.8% Asian, 8.8% Black, 6.5% Hispanic/Latinx, 2.9% Native American, .6% Pacific Islander). Each face was categorized as a member of a particular racial-ethnic or gender group by at least 90% of norming participants, as well as being judged to be happy, between the ages of 20 and 60, of good image quality, and looking toward the camera. We then used propensity matching (Randolph and Falbe, 2014) to select two sets of faces in which the stimulus groups (defined by perceived race and perceived gender, e.g., Asian women) were matched on apparent age, attractiveness, friendliness, image quality, and whether the image would be a good profile picture. This image selection process was intended to provide sets of images that differed by race and gender but were otherwise quite similar in their content and quality. Using two sets of matched images allows for greater generalization across specific faces.

Participants were randomly assigned to the first or second set of faces. Within that set of faces, we used the names of small towns to list an ostensible birthplace for each target. Asian targets were pseudo-randomly paired with a birthplace either in the United States or in China, while White targets were pseudo-randomly paired with a birthplace either in the United States or in the UK.

[1]Participants also evaluated the faces of four Black people assigned to US birthplaces; these ancillary data are omitted from the present analysis.

COVID Self-Report

Our analyses focus on responses to two questions related to participants' experiences during the pandemic. Participants reported their perceived risk of contracting COVID-19 ("What is your risk of contagion from COVID-19?"; *1/Much lower risk than the average US resident—7/Much higher risk than the average US resident*; $M = 4.35$, $SD = 1.42$) and the extent to which they hold China responsible for the pandemic ("Do you think China is responsible for the global COVID-19 pandemic?"; *1/Not at all responsible—7/Entirely responsible*; $M = 4.97$, $SD = 1.73$). We use the responses to these items as two central predictor variables.

Actual COVID Rates

We used The New York Times (2021) COVID database and 2019 US census population projections to calculate the one-week rolling average of new cases *per capita* in each US state during our period of recruitment. We matched this with participants according to their state of residence. Across our data, this metric ranges from .009 to .552%. This means that, during the prior 7 days, there were 9–552 new cases per day per 1,000,000 people in each participant's state. We use the average across a week to avoid effects of days of the week (e.g., higher reporting on Tuesdays as weekend counts were integrated). For analysis purposes, we rescaled this variable to go from 0 to 1.

RESULTS

We were centrally interested in whether White participants' exposure to COVID-19 would predict judging Asian people as less American. We examined the extent to which Americanness ratings are predicted by actual COVID rates in the participant's state, the participant's subjective sense of health risk from COVID, the extent to which the participant held China responsible for the pandemic, and participant political ideology. We present results from the semantic differential and face-rating tasks separately, using a single simultaneous regression model for each dependent variable with follow-up tests as described. Thus, all results reflect the unique effect of a particular predictor above and beyond the predictor's shared variance with other predictors (see **Table 1** for correlations between predictors).

We use a multi-level modeling approach to account for participant-level differences in overall tendency to rate groups or individuals as more or less American (Raudenbush and Bryk, 2002; Bates et al., 2015). We report significance for fixed

TABLE 1 | Correlations between predictor variables.

S. no.	Variable	1	2	3
1.	COVID rates in state	–		
2.	Subjective health risk	.043	–	
3.	Political Ideology	.085**	.094***	–
4.	Holding China Responsible	.093***	.280***	.348***

$^{**}p < .01$; $^{***}p < .001$.

effects using Satterthwaite's method (Kuznetsova et al., 2017), and all reported means are estimated marginal means. Our code and a de-identified data file can be found on OSF at: https://osf.io/b3wu6/. Robustness checks, including analyses run with the full sample (no participant exclusions) and run with data quality exclusions, but no race constraints, indicate that our central findings hold regardless of these exclusions. All of these datasets are available at the OSF link above.

Semantic Differential

To see whether COVID variables predict semantic differential ratings, we examined perceived Americanness as a function of target group (Asian-White), two COVID-related individual difference variables (actual COVID risk in state, subjective health risk), two political individual difference variables (blaming China for the pandemic, political ideology), and the interactions of these individual difference variables with target group. Key questions concern (a) whether we replicate the "perpetual foreigner" stereotype in which Asian people are judged less American than White people, and (b) whether the size of that effect differs according to any of our predictors. We account for the repeated-measures nature of the data by including a random intercept of participant.

There was a main effect of target race/ethnicity, such that White people living in the United States were rated more American than Asian people living in the United States [$t(1291) = 10.623$, $p < .0001$; $M_{Asian} = -.0343$, $SE_{Asian} = .01$, $M_{White} = .3598$, $SE_{White} = .01$]. Neither actual state-level COVID rates nor political ideology predicted overall foreignness ratings or differential foreignness ratings by target group (ps > .2). Sense of personal health risk and blaming China for the pandemic predicted lower Americanness ratings overall [personal health risk: $t(1292) = -2.754$, $p = .006$; blaming China: $t(1300) = -4.563$, $p < .0001$]. The effects of blaming China and subjective health risk both differed by target group [personal health risk: $t(1291) = -9.060$, $p < .0001$; blaming China: $t(1288) = 5.184$, $p < .0001$]. While blaming China predicted rating Asian people (but not White people) as less American, subjective health risk predicted rating White people as less American and Asian people as more American (see **Figure 1**).

Face Evaluation

We used a similar modeling approach to look at each participant's 16 target face Americanness ratings. We include a random intercept for specific target face. We also include a fixed effect of birthplace (United States vs. outside of the United States), a fixed effect for the interaction of birthplace and target group, and fixed effects for these interacting with our individual difference predictors.

Once again, White faces were rated as more American than Asian faces [$t(278) = 20.014$, $p < .0001$]. Faces associated with a US birthplace were rated as more American than those associated with a non-US birthplace [$t(19520) = 16.708$, $p < .0001$]. These two effects interacted, such that the birthplace "penalty" was greater for White people than Asian people [$t(19520) = 2.953$, $p = .003$; Asian faces: $t(9105) = 10.934$, $p < .0001$; White faces: $t(9119) = 15.779$, $p < .0001$].

Once again, actual COVID cases did not predict overall attributions of Americanness ($p = .45$). Actual COVID cases also did not predict differential attribution of Americanness based on birthplace ($p = .18$), or by the interaction of birthplace and target group ($p = .29$). However, it did predict differential attribution of Americanness by target group [$t(19520) = -4.727$, $p < .0001$], such that it predicted rating White people (but not Asian people) as slightly less American [White faces: $t(1300) = -2.487$, $p = .01$; Asian faces: $p > .45$].

Further, political ideology did not predict overall attributions of Americanness ($p > .63$). It predicted differential attribution of Americanness by target group [$t(19520) = 4.495$, $p < .0001$] and birthplace [$t(19520) = -5.512$, $p < .0001$], but not by the interaction of group and birthplace ($p > .85$). The Asian/White difference in Americanness was larger among conservatives than liberals, while the US-born/Foreign-born difference in Americanness was smaller among conservatives than liberals.

Subjective health risk predicted rating faces as more American overall [$t(1301) = 7.267$, $p < .0001$]. It also predicted differential rating by target group [$t(19530) = -18.965$, $p < .0001$] such that subjective health risk predicted rating Asian faces as significantly more American [$t(1301) = 10.051$, $p < .0001$], but had no significant effect on ratings of White faces ($p > .8$). Though it did not predict differential rating by birthplace ($p > .79$), it did predict differential rating based on the interaction of birthplace and

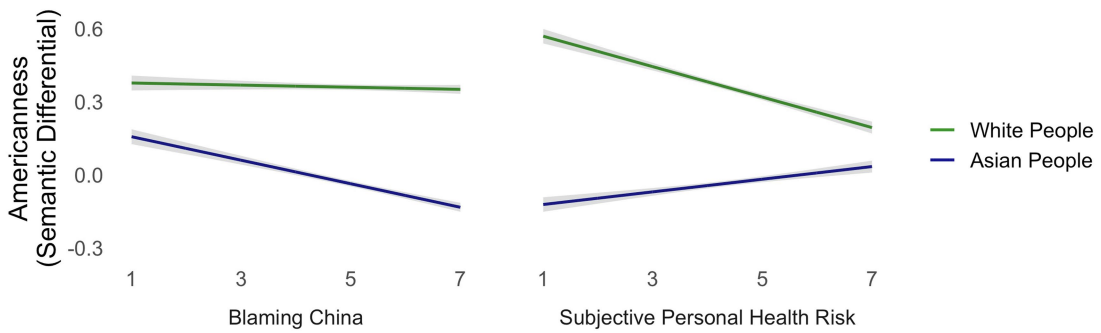

FIGURE 1 | Participants with greater subjective health risk rated Asian faces—and especially Asian faces associated with US birthplaces—more American than did participants lower in subjective health risk.

target group [$t(19530) = -4.304$, $p < .0001$]. Altogether, this means that participants reporting greater sense of health risk rated Asian (but not White) faces as more American and that this effect was greatest for Asians associated with US birthplaces (see **Figure 2**).

Blaming China predicted rating faces as less American overall [$t(1300) = -3.722$, $p < .001$]. It also predicted differential ratings by target group [$t(19520) = 9.516$, $p < .0001$] and by birthplace [$t(19520) = 4.6128$, $p < .0001$], but not by the interaction of target group and birthplace ($p > .55$). Blaming China for the pandemic predicted greater Asian-White differentiation in Americanness ratings, and greater US-born/Foreign-born differentiation in Americanness ratings (see **Figure 3**).

DISCUSSION

These findings provide a snapshot of White Americans' experiences during the first summer of the COVID-19 pandemic and how these experiences are connected to perceptions of Asian people in America. Specifically, we probed the potency of the "perpetual foreigner" stereotype of Asian Americans among White Americans (Cheryan and Monin, 2005) during an unprecedented international public health crisis. While previous work has focused on the relationship between pathogen concern and increased levels of prejudice toward certain groups, we focus instead on the attribution of Americanness (versus foreignness) to Asian targets. In particular, we explored whether attributions of Americanness were associated with pathogen threat *per se* or other sociopolitical attitudes related to this threat, namely, the extent to which people blame China for the pandemic.

Consistent with prior research, our participants rated White people as significantly more American than Asian people on both a composite semantic differential scale (American-Foreign, Familiar-Unfamiliar, Insider-Outsider) and a face-rating measure. We were particularly interested in exploring how this tendency might intersect with attitudes and experiences related to the COVID-19 pandemic. In contrast with expectations based on previous literature, neither actual COVID-19 case rates nor subjective health risk predicted lower Americanness ratings for Asian targets. In fact, although previous literature would suggest that increased pathogen threat due to the pandemic is likely to *negatively* influence intergroup perceptions (Dhanani and Franz, 2020; Mandalaywala et al., 2020), we find evidence for the opposite effect in our sample. That is, when a participant's health concern was higher, the Asian target group and Asian faces were judged as more American than when subjective health concern was lower.

Interestingly, we find that the gap in the perceived Americanness of White versus Asian people narrows as the perceived risks from COVID-19 increase, not only due to increased perceptions of the Americanness of Asian people,

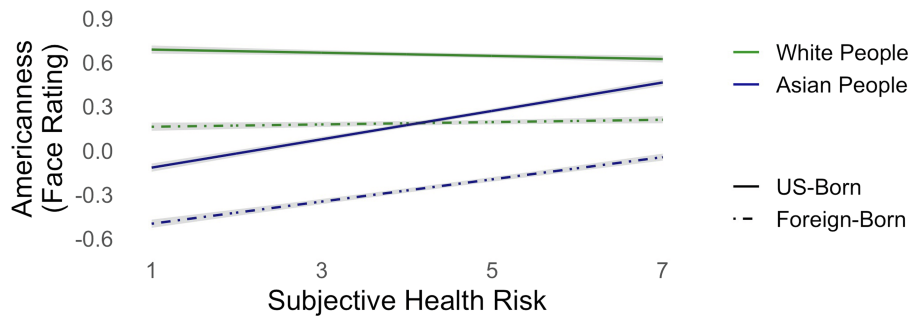

FIGURE 2 | Blaming the COVID-19 pandemic on China predicted greater Asian-White differentiation in attributing Americanness and greater differentiation on birthplace in attributing Americanness.

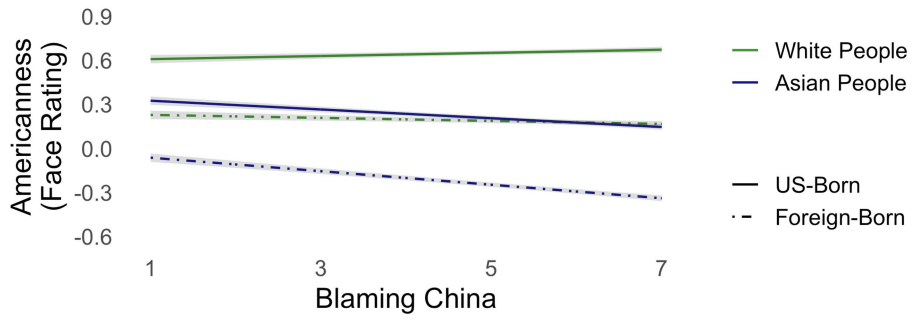

FIGURE 3 | Blaming China for COVID predicted rating Asian people as less American, while sense of health risk predicted rating White people as less American and Asian people as more American.

but also because of decreased perceptions of the Americanness of White people. Although this finding seems inconsistent with the idea that pathogen threat promotes intergroup biases, the COVID-19 context may be unusual in that a number of influential public voices argued that the virus was actually not a serious danger (Imhoff and Lamberty, 2020; Lewis, 2020). Subjective feelings of threat thus require perceiving the actual pathogen-related risk despite salient attempts to trivialize or minimize it. Weil and Wolfe (2021) have shown that perceived risks from COVID, and intentions to take self-protective actions, are positively correlated with greater cognitive reflection. Greater cognitive reflection, in turn, predicts a reduced tendency to think in simplistic, stereotypic ways and reduced expression of racial biases (e.g., Waller, 1993; Toplak et al., 2011). Conversely, feeling relatively invulnerable to a pathogen can reflect a tendency toward ego-defensive cognitive styles (Harris et al., 2008), which have also been associated with a greater need to view ingroups more favorably than outgroups (e.g., Allport, 1954; Hepper et al., 2010). Thus, White Americans who report higher personal vulnerability to COVID-19 may have a lower likelihood of thinking about racial groups in stereotypic ways because of broader cognitive tendencies (i.e., non-defensive cognitive reflection) that go along with recognizing and acknowledging the risks posed by COVID-19.

Sociopolitical attitudes proved to be relevant predictors of the magnitude of the perpetual foreigner bias. Although both liberal and conservative participants stereotyped Asians as relatively foreign, the effect was larger among conservative participants (at least when rating faces). Moreover, increasing tendencies to blame China for the pandemic were associated with viewing Asian people as more foreign. Scholars have suggested that discourse around the naming of a virus and the source of a virus can have implications for intergroup attitudes and relations (Hoppe, 2018; Cho et al., 2021). Our results seem to support these claims, and in fact, we find that blaming China for the pandemic was a stronger predictor of negative intergroup perceptions than health threat.

In our data, neither actual COVID-19 case rates nor reported subjective health risk predicted heightened associations between Asians and foreignness. It may be that this stereotypic association operates differently from general prejudice, in terms of how White Americans respond to a pathogen threat. Although the threat engendered by the COVID-19 pandemic has been linked with increases in anti-Asian sentiment and violence, our data suggest that perceptions of foreignness may not be the psychological mechanism behind this discrimination, as subjective pathogen threat was associated with reductions in foreignness attributions. However, it may be that a small subset of the population does react to pathogen threat with increased perceptions of foreignness toward Asian Americans and that the documented offenses are driven by this atypical, "concentrated" group (Campbell and Brauer, 2021).

Even so, we do find evidence consistent with the notion that Asians are perpetually perceived as foreign, relative to White people, and that increased blame for the pandemic directed toward China is associated with increased attributions of foreignness toward Asian people. Biased attributions of foreignness to groups of Americans are a manifestation of ongoing xenophobia and ethnonationalism in modern society. As such, it has immediate and everyday impacts on the lives of people culturally deemed "un-American." Presumptions of foreignness directed toward Asian Americans constitute an everyday microaggression (Sue et al., 2007, 2009) that can decrease feelings of belonging (Huynh et al., 2011) and negatively impact mental health (e.g., affect, stress, and depressive symptoms; Wang et al., 2013; Albuja et al., 2019a,b). Similar results have been shown in other racial-ethnic groups culturally stereotyped as "foreign" (e.g., Barlow et al., 2000; Sanchez et al., 2018). Biased perceptions of foreignness can thus have substantial adverse consequences for both individuals and groups.

Limitations

Our study has several limitations. First, all our effects should be considered associative, rather than causal, as we do not manipulate any of our predictor variables. Further, as outlined in our methods, we constrain our analyses to focus on just White American participants. Thus, our results should not be assumed to generalize beyond this sub-population. In addition, although previous work suggests that many White Americans blur distinctions between different Asian cultural and national groups, there are clear reasons to believe that studying perceptions of specific Asian subgroups could yield meaningful nuance (Goh and McCue, 2021). In our study, we followed prior work in focusing on Asian Americans as an aggregate group, but we recognize that investigations focusing on perceptions of Asians with different national heritages could prove extremely valuable. Finally, we acknowledge that respondents' considered responses to an online survey may not necessarily be indicative of their spontaneous behavior in actual daily life contexts, including intergroup contact situations.

CONCLUSION

In a robust investigation of White Americans' perceptions of Asian and Asian American people, we find evidence of the "perceptual foreigner" stereotype of Asians in America. In addition, we find that COVID-19 case rates and subjective health risk during the pandemic do not predict increased attributions of foreignness toward Asian people. However, we do find that sociopolitical attitudes, such as assigning blame to China for the pandemic do predict increased foreignness perceptions of Asians. Together, we provide an interesting complement to previous literature focusing on the effects of pathogen concern and intergroup attitudes.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are publicly available. This data can be found here: https://osf.io/b3wu6/.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Northwestern University Institutional Review Board. The participants provided their express informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JD, NG, and GB contributed to conception and design of the study and wrote sections of the manuscript. JD and NG both prepared and administered the survey tool for data collection and organized and cleaned the database(s). NG performed most of the statistical analysis and led the efforts for the acquisition of funding. JD performed supplemental analyses, including robustness checks and wrote the first draft of the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

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You Are Old, but Are You Out? Intergenerational Contact Impacts on Out-Group Perspective-Taking and on the Roles of Stereotyping and Intergroup Anxiety

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Perspective-taking (PT) is an important ability to imagine the world from another's point of view. Prior studies have shown that younger adults are more likely to consider the opinions of age-based in-group members relative to out-group members. However, the cause of this priority is still unknown. We conducted three independent studies to explore the effect of intergenerational contact on younger adults' PT toward older adults and the possible roles of stereotyping and intergroup anxiety. A total of 192 college students completed the Perspective taking Scale in Study 1 after being primed with age-based intergroup relationships. The results indicated that younger adults found it more difficult to take the perspective of older adults than that of their peers. 200 college students completed the Prior Contact Scale, Intergroup Anxiety Scale, Negative Stereotype Scale, and PT Scale in Study 2. The results demonstrated that intergenerational contact improved PT toward older adults by disrupting negative stereotypes, and intergroup anxiety moderated this mediating relationship. A total of 215 college students completed the PT Scale in the context of imagining intergenerational contact in Study 3. Interestingly, imagined contact effectively increased younger adults' ability to take older adults' perspectives. The present research verifies that contact is important for influencing younger adults' emotional (intergroup anxiety) and attitudinal (stereotyping) factors that are critical to improving younger adults' ability to take older people's perspectives. This is of great significance for developing harmonious intergenerational relationships.

Keywords: intergenerational relationship, prior contact, imagined contact, perspective-taking, stereotype, intergroup anxiety

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INTRODUCTION

In a family, younger children or younger adults often live together with older adults, especially in an extended family. A younger child can develop their social abilities to enable them to take the perspective of older adults through their contact experience in harmonious family life. Nonetheless, they still seem to hold negative stereotypes toward older adults due to physical differences and

psychological distance, and these hinder the communication between these two age-based groups. For example, because of the fact that the older generation is more vulnerable to COVID-19, some younger adults hold negative stereotypes toward the older generation regarding the global pandemic (Madrigal et al., 2021). They even use the phrase Boomer Remover to represent the fact that older adults have higher COVID-19 mortality than younger adults (Meisner, 2020). With regard to social welfare, individuals' well-being, and cooperation between different generations in the long term, one must pay attention to the development of a harmonious and respectful intergenerational relationship. It is of great significance, therefore, for younger adults to be able to interpret environmental clues regarding stereotypes and take the perspective of older adults if they are to communicate effectively with each other.

Perspective-taking (PT) is the process of "imagining oneself in another's shoes." It is a strategy that can reduce stereotyping and prejudice and promote social harmony (Galinsky et al., 2005). It is thought that PT is a powerful tool to improve intergroup relationships (e.g., Galinsky and Moskowitz, 2000; Trötschel et al., 2011), including intergenerational relationships (Keeling, 2012). Less intergenerational contact experience (e.g., Kwong See and Nicoladis, 2010; Lytle et al., 2020), negative stereotypes of older adults (Hargis and Castel, 2019), and a higher level of intergenerational anxiety (Todd et al., 2015) toward older adults may be the reasons that younger adults do not easily take the older generation's perspective. This may be harmful to intergenerational relationships and aggravate intergenerational conflicts. With regard to contact, researchers believe that contact between groups allows individuals (such as younger adults) to take the perspective of out-group members (such as older adults), which then reduces prejudice (Pettigrew and Tropp, 2008). Conversely, younger adults may have a worse understanding of older adults due to social or geographic distance in daily life (Monserud, 2011). Negative stereotypes toward older adults are that they physically fragile and disabled, have obvious problems with memory deficits (Shepherd and Brochu, 2021) and conservative thoughts, also are poor at multitasking and technology (Weeks et al., 2017). Some younger adults even believe that they occupy jobs, opportunities, and resources that "belong" to the younger generation (Meisner, 2020). These kinds of negative stereotypes may engender younger adults' anxiety toward the older generation (Fasbender and Wang, 2017), adding to intergenerational prejudice and discrimination.

Prior studies have shown that younger adults' PT is influenced by life experience (contact), emotional factors (intergroup anxiety), and attitudinal factors (stereotyping). However, the relationships between these factors and the mechanisms beyond them are still unknown. Therefore, the present research aims at understanding how younger adults' intergenerational contact experiences influence their ability to "stand in older adults' shoes" (PT), which is critical to intergenerational communication and cooperation. We also investigate the mediating effect of negative stereotypes toward older adults and the moderating effect of intergroup anxiety in the relationship between prior intergenerational contact and PT.

The Younger Generation Takes the Perspective of Younger Adults More Easily Than That of Older Adults

Prior intergroup relationship research has found that individuals more easily take the perspective of in-groups rather than out-groups (Galinsky and Moskowitz, 2000). This effect is known as in-group favoritism and out-group bias. PT can be used as an efficient tool to increase out-group cooperation (see Bilewicz, 2009; Trötschel et al., 2011). With regard to age-based intergroup relationships, one may argue that the age-based group identity of younger adults may change as they age (Short et al., 2019), indicating that the younger generation and the older generation may become more unified. For example, in the context of Chinese traditional prefigurative culture, the younger generation was a total replication of the older generation in cultural inheritance, and the moral authority spontaneously transferred from the parents to the child when the child became a parent in their own right (Zheng and Chen, 2012). However, the intergenerational relationship research in the modern age had emphasized the independence between generations, making age a standard to separate younger adults and older adults in research (e.g., Meshel and MCGlynn, 2004; Tam et al., 2006; see also Zuo et al., 2007; Chi, 2013; Teater, 2018). Additionally, according to the present situation of intergeneration relationships that we discussed above, it is also necessary for us to consider whether age may separate these two generations due to apparent cognitive and physical differences between them and to the struggle of survival in the context of the COVID-19. Moreover, it had been reasonably supposed by Galinsky et al. (2008) that individuals hold more strongly to stereotypes after taking the perspectives of the targets, no matter who the targets were. They found that individuals utilized stereotypes about the targets in order to form their perspectives (Galinsky et al., 2005), which in turn increased the self-other overlap through the process of including the other's stereotypical traits in the self (Galinsky et al., 2008). These empirical studies give us grounds to put forward our assumption that younger adults will try to utilize their negative stereotypes about older adults in order to take their perspective, but only to find it difficult to proceed because of the negative traits (e.g., conservative thoughts) they imposed on older adults. On the other hand, because of the similarity of their peers, they find it easier to take the perspectives of younger adults. For example, young children associate with peers by using age information (Yoo, 2015).

All in all, the younger generation will act differently toward their peers (the age-based in-group) than to older adults (the age-based out-group) in their PT. Specifically, the current research expects a pattern of PT differential in intergroup relationships; in that, younger adults may find it more difficult to take the perspective of older people than that of younger people. Based on the aforementioned literature reviews and assumptions, the

present research expects there to be an in-group favoritism effect in intergenerational relationships; thus, we propose our first hypothesis to be tested in Study 1:

H1: The younger generation will take the perspective of younger adults more easily than that of older adults.

Negative Stereotypes Disrupt the Younger Generation's PT Toward Older Adults

To our present knowledge, many prior studies have focused on the impact of PT on stereotyping (see Aberson and Haag, 2007; Wang et al., 2018; Baryshevtsev et al., 2020), but few have considered the reverse (see Lin et al., 2021). In the field of intergenerational research, only one published study has analyzed the influence of stereotypes about older adults on PT. Hargis and Castel (2019) asked younger participants to estimate the memory task accuracy of older participants before starting the same task themselves. It was found that the younger participants overestimated the performance of the older participants. The researchers assumed that this was because young adults lacked memory information about the older participants and had to refer to their stereotypes toward old people to estimate, which in turn impaired their PT toward old participants. Although there is an urgent need for relevant empirical evidence in the field of intergenerational relationships, current intergroup relation research suggests that individuals may take the out-groups' perspective under the influence of out-group stereotypes (Galinsky et al., 2008). The same mechanism may also occur in the process of the younger generation taking the perspective of the older generation, meaning that younger adults will imitate the targets' state of mind according to their negative perceptions toward older adults (e.g., lower memory capacity and stubbornness) and will react correspondingly on this basis. In this point of view, younger adults will have difficulties in taking older adults' perspectives due to the conflict between actual and perceived older adults' abilities. The second hypothesis of the current research is thus proposed:

H2: The younger generation's negative stereotypes toward older adults will reduce their ability to take the older generation's perspective.

Impacts of Intergenerational Contact on PT and the Mediating Role of Stereotyping

Prior research has reached a consensus that intergroup contact effectively promotes PT toward out-group members (see Aberson and Haag, 2007; Swart et al., 2011; Teater and Chonody, 2015; Mana, 2019). Pettigrew and Tropp (2008) used a meta-analysis to verify that intergroup contact increases individuals' PT toward out-group members. This conclusion has also been found to be valid for research in the field of intergenerational relationships. For example, Fair and Delaplane (2015) conducted a longitudinal study, namely the Elementary Students' Intergenerational Service Learning Project, in which second-graders were asked to visit older adults monthly and connect with them in retirement facilities. This research found that children became more empathetic and became more readily able to take the older adults' perspective at the end of the project. Unfortunately, there is little additional empirical evidence to verify the influence of contact toward PT in intergenerational relationships. We thus propose the third hypothesis:

H3: The more prior intergenerational contact younger adults have experienced, the more easily they will take the older generation's perspective.

Many social psychologists agree with the view that the more individuals contact out-group members, the fewer stereotypes will be activated during contact (e.g., Galinsky and Moskowitz, 2000). Earlier studies revealed that younger adults who frequently contacted older people had more precise information and a more positive attitude toward them, showing an out-group favoritism effect (Jiang and Zhou, 2012; Hock and Mickus, 2019; Cesnales et al., 2020). Madrigal et al. (2021) used a convergent parallel mixed method design to study the impact of an art installation on intergenerational relationships, and they found that young adults' negative stereotypes about older adults turned into positive perceptions. Keeling (2012), working with young rural students from New Zealand, suggested that teenagers who have more face-to-face contact experience with their grandparents would evaluate their grandparents more positively and maintain a more intimate relationship with them. On the other hand, if the younger generation kept avoiding interactions with the older generation, then the younger would misinterpret the older in many ways (Weeks et al., 2017), which in turn would intensify negative stereotypes. Blieszner and Artale (2001) conducted mixed-method research to investigate how intergenerational contact changes the younger adults' misperceptions about older adults. More than half of the participants demonstrated that interactions and connections between themselves and older people bridged the generational gap and increased their understanding of older people. It can be seen from the research results above that prior contact can effectively relieve and eliminate younger adults' negative stereotypes and prejudice toward older adults.

Integrating the hypotheses that negative stereotyping disrupts PT (H2), the view that intergenerational contact may improve younger adults' PT toward older adults (H3), and the results that contact decreases the level of negative stereotypes, the present research thus investigates the mediating role of negative stereotypes in the relationship between prior contact and PT (H4).

H4: The younger generation's prior contact with older adults will have an impact on out-group perspective-taking through the mediation of negative stereotypes.

The Moderating Role of Intergroup Anxiety

Intergroup anxiety reflects the extent of a person's negative experiences, such as nervousness, awkwardness, and even hostility, when engaging with out-groups or anticipating such engagement (Stephan, 2014). Several studies have indicated that

intergroup anxiety decreases the level of individuals' engagement intention toward out-groups and thus triggers negative reactions in intergroup encounters. This is an obstacle to effectively interacting with out-groups and damages intergroup trust (Plant and Devine, 2003; Aberson and Haag, 2007).

As an affective variable, intergroup anxiety has been considered to influence the relationship between prior contact and PT. Anxiety decreases the ability to take others' perspective and increases the tendency toward egocentricity (Todd et al., 2015). In other words, if a person encounters an out-group member and feels more anxious than they would with an in-group member, then this negative emotion may impede their ability to take the perspective of the out-group member.

As for the relationship between prior contact and stereotyping, a number of prior studies have focused on the mediating role of intergroup anxiety rather than moderation (see Abrams et al., 2006; Hutchison et al., 2010; Fasbender and Wang, 2017). These results are consistent with the Intergroup Anxiety Theory (Stephan, 2014), which proposes that intergroup anxiety is a mediator between its antecedents (i.e., prior contact) and consequences (i.e., out-group stereotyping). Stephan (2014) also mentioned that this mediated causal relationship is reciprocal, which means intergroup anxiety may also have an impact on its antecedents, and its consequences may also have an impact on it. In addition to the view that a higher level of intergroup anxiety is related to lower levels of contact and negative stereotypes (no matter what the directions of these complex relations are), one could propose that intergroup anxiety has another potential function to influence the relationship between variables besides mediation, namely, moderation. For example, Reimer et al. (2021) conducted a field study to verify the effectiveness of contact-based intergroup relationship intervention and found that positive contact indeed decreased intergroup anxiety and increased out-group PT but not intergroup attitudes. This result offers a possibility that a lower level of intergroup anxiety may reduce the influence of contact toward out-group attitudes. Few studies have investigated whether different levels of intergroup anxiety have different impacts on the relationship between prior contact and stereotype, especially in the intergenerational domain. Thus, one of the aims of the present study is to investigate the potential moderating role of intergroup anxiety between prior intergenerational contact and stereotypes of older adults.

In all, the present research assumes that intergroup anxiety moderates the relationships between stereotypes and PT. Considering the complex relationships among prior contact, negative stereotypes, intergroup anxiety, and PT that were discussed above, we propose the fifth hypothesis.

H5: Intergroup anxiety will moderate the relationships between prior contact and perspective-taking (H5a), between prior contact and stereotyping (H5b), and between stereotyping and perspective-taking (H5c).

The aim of Study 2 in the current research is to construct a moderating mediation model to test H2 through H5. To be more specific, in the hypothetical model (see **Figure 1**), prior contact influences PT through the mediation of negative stereotypes, and intergroup anxiety moderates all three pathways in the mediating relationships.

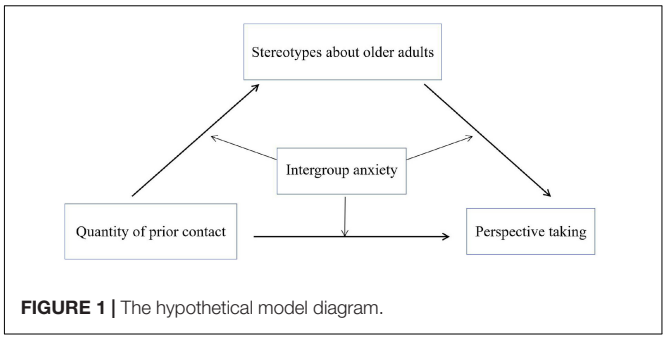

FIGURE 1 | The hypothetical model diagram.

Impacts of Imagined Intergenerational Contact on Perspective-Taking

According to the discussion above, intergenerational contact may have an impact on PT; we have tested this in Study 1 and Study 2. However, from the perspective of research intervention, it is difficult to change individuals' experiences toward intergenerational contacts that happened in the past. It is better and more efficient to intervene in this process through the human imagination. Imagined intergroup contact is the mental simulation of social interaction with a member or members of an out-group category (Crisp and Turner, 2009), and it is a wonderful opportunity to seek intergroup connection across time and space. Abundant research has shown that the positive-imagined intergroup contact encourages positive intergroup relationships (e.g., Bilewicz and Kogan, 2014; Ioannou et al., 2015; Vezzali et al., 2015), and the same truth applies to intergenerational relationships (e.g., Prior and Sargent-Cox, 2014). There is rich evidence regarding whether and how younger adults change their attitudes toward older adults after imagining positive age-based out-group interaction. For example, Chen et al. (2016) found that younger adults who imagined positive encounters with older adults will perceive older adults more positively. The research of Harwood et al. (2015) demonstrated that the positive-imagined intergenerational contact not only improved younger individuals' positive perceptions of older adults but also increased their intention to communicate with older adults in the future. Unfortunately, few empirical studies have investigated whether the younger adults' PT ability toward older people improves after imagining positive intergenerational contact. Thus, the present study considers the perspective of younger adults toward positive intergenerational encounters, using an imagined contact scenario paradigm (Study 3) to investigate how the younger adults' PT ability toward older people is changed. We thus posit the following hypothesis:

H6: The younger generation will take older adults' perspective more easily after imagining positive contact with the older generation.

All in all, the present research conducts three independent studies to examine the factors that affect intergenerational

relationships. Specifically, Study 1 aims to confirm differences in younger adults' PT toward different generations, Study 2 constructs a moderating mediation model to investigate the influence of younger adults' prior contact on age-based out-group PT, and Study 3 examines the intervention effectiveness of imagined contact on PT.

STUDY 1: THE DIFFERENTIAL OF PT TOWARD AGE-BASED INTERGROUP TARGETS

Methods

Participants

A power analysis conducted in G*power (version 3.1.9.7) indicated that the minimum required total sample size was $N = 210$ (with each group having a sample size of 105) to achieve a sufficient power ($1 - \beta = 0.95$) with a medium effect size of Cohen's $d = 0.50$. We then recruited 192 college students ($M_{age} = 21.90$, SD = 2.66) from a university in Shaanxi Province as participants for the current study and randomly assigned them to either the age-based in-group (whose interaction target was younger adults, $N = 92$, 25 men) or the age-based out-group (whose interaction target was older adults, $N = 100$, 15 men).

Instruments

Perspective-Taking

The PT Subscale of Davis's (1980) Interpersonal Reactivity Index was used to measure participants' PT. Individual scale items were revised to match the interaction targets. The targets were the younger generation in the age-based in-group and the older generation in the age-based out-group. There were seven items on the scale (e.g., "I try to look at older/younger adults' side of a disagreement before I make a decision"). Response options were 1 = *not at all* to 5 = *very much*. Higher total scores indicated that individuals more easily took the other group's perspective. The internal consistency of the scale was 0.75. The Cronbach's α for the in-group was 0.78, and the Cronbach's α for the out-group was 0.71.

Procedure

Before conducting the formal process of filling out questionnaires, all participants in both the age-based in-group and the out-group were asked to view two human facial pictures (a male and a female, see **Figure 2**) for 30 s to prime age-based intergroup relationships. This was done according to the priming paradigm of Ofan et al. (2011), which holds that simply showing facial images of different races can evoke participants' evaluative associations with race. Hudson et al. (2019) similarly effectively primed participants' perception toward race-based intergroup relations through the assessment of racial identity after demonstrating different race facial images. These results indicate that salient visual characteristics of facial images may increase the salience of intergroup relations (e.g., for race). Like race, age is also included in the "Big Three" of cues by which people process social categorization (Zuo et al., 2019). Age information of facial images can also be rapidly extracted

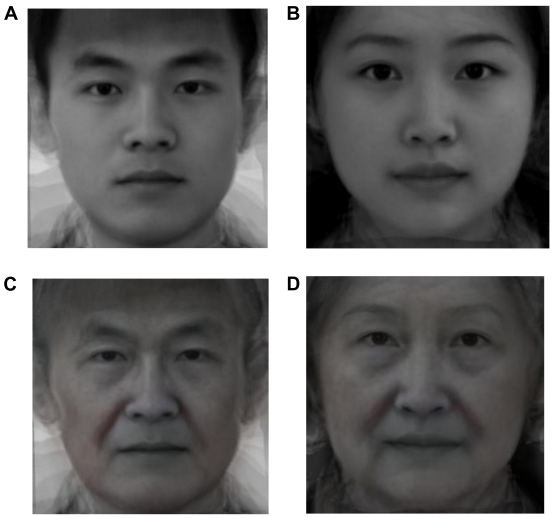

FIGURE 2 | Facial images for different age groups. Pictures **(A,B)** were the priming facial pictures that were shown to participants in the age-based in-group. Pictures **(C,D)** were the priming facial pictures that were shown to participants in the age-based out-group. Images sourced from Hou et al. (2019) (CC-BY).

(Rhodes and Anastasi, 2012). This demonstrates a robust intergroup effect of the own-age bias (OAB), the phenomenon by younger adults can better recall facial images of an age-based in-group (i.e., younger adults) than of an out-group (i.e., older adults) (Short et al., 2019). In all, it is reasonable to prime younger adults' perception toward intergenerational relations by demonstrating facial images of different ages.

Thus, in the current study, participants in the in-group relationship condition viewed two younger adults' facial images (see **Figures 2A,B**), whereas participants in the out-group relationship condition viewed two older adults' facial images (see **Figures 2C,D**). This drew their attention to the age-based group boundaries. Then, they completed the questionnaires. The facial images of younger adults used in the study of Hou et al. (2019) were adopted in the current study. All facial images are composite images composed of four standard human faces from Hou's research (Hou et al., 2019), indicating that all the facial images used in the current research were not taken from real persons. We then used a professional photo filter software to age the figures to obtain the facial images of older adults that were required. All facial images were unbiased processed. In order to test the validity of this manipulation, we added a question for assessing the similarity of identity in age between participants and the targets in the priming pictures through 1 = *not at all* to 7 = *very much*. Higher scores indicated that the younger adults had a higher level of age identification with the targets.

Results

Validity Test of Priming for Age-Based Intergroup Relationships

An independent-sample *t*-test showed that the identity similarity scores of the age-based in-group participants ($M = 3.87$,

SD = 1.49) were significantly higher than those for the out-group participants (M = 2.67, SD = 1.80), t = 5.01, $p < 0.001$, Cohen's d = 0.73, indicating that facial pictures of different generations effectively aroused age-based intergroup relationships in the present participant cohort.

Tests of Differential in Perspective-Taking

Preliminary analysis showed that age and gender were not correlated to PT of either the in-groups or the out-groups. In case age and gender potentially influenced the core variable (PT), both demographic variables were still controlled as covariates. UNIANOVAs showed that the PT scores for the age-based in-group (M = 26.50, SD = 4.08) were significantly higher than those for the out-groups (M = 24.87, SD = 3.90), F = 8.07, p = 0.005, η^2 = 0.04. This result supports H1, indicating that compared to age-based in-groups, younger adults find it more difficult to take older adults' perspective. This appears to be an example of the phenomenon of the generation gap.

Discussion

The current study verified the differentiation of younger adult PT toward age-based in-group and out-group targets. Specifically, younger adults took the perspective of the younger generation more easily than that of the older generation, which implies that misunderstanding and misperception may exist in age-based intergroup relationships. The mechanism behind the differential thus needed further investigation.

STUDY 2: THE IMPACT OF PRIOR CONTACT ON AGE-BASED OUT-GROUP PT: THE MEDIATING ROLE OF NEGATIVE STEREOTYPES AND THE MODERATING ROLE OF INTERGROUP ANXIETY

Methods

Participants

Participants were recruited from a university in Shaanxi Province. There were 200 college students (M_{age} = 21.54, SD = 3.07, 34 men) who took part in the survey. Because of the imbalanced ratio of gender in this case, we gave special attention to analyzing and controlling the potential influence of gender in follow-up analyses.

Instruments

Prior Contact

The quantity of contact subscale was extracted from the prior contact scale of Husnu and Crisp (2010) to measure younger adults' previous contact with older adults. The current study also made an adaption to item statements to match the PT target of older adults. There were four items: "How many older adults do you know?"; "In everyday life, how often do you encounter older adults?"; "In everyday life, how frequently do you interact with older adults?"; and "In everyday life, how much contact do you have with older adults?" All items above used a scale from 1 = *none* to 7 = *a lot*. Higher total scores indicated that individuals had a higher level of contact with older adults. The Cronbach's α was 0.88 in the current study.

The current study also extracted one particular item, "unpleasant–pleasant," in the subscale of the quality of contact to categorize different types of prior contact according to the contact valence. This item also used a 7-point Likert scale. Scores higher than four points represented positive contact and lower than four points represented negative contact. Accordingly, the current study could also investigate whether the valence of prior contact influences younger adults' PT toward older adults, but the potential mediating or moderating functions of quality of contact were not addressed in the present study.

Intergroup Anxiety

The Intergroup Anxiety Scale developed by Stephan and Stephan (1985) was used to measure the level of anxiety felt when younger adults contact older adults. There were 10 adjective terms for describing feelings of interaction with out-group members, including seven negatively valenced adjectives (e.g., awkward and irritated) and three positively/reversed-scored adjectives (happy, accepted, and confident). Participants were asked to evaluate their corresponding feelings from 1 = *not at all* to 7 = *very much*, according to their experience of interactions with older adults. Higher total scores demonstrated that individuals had experienced a higher level of anxiety when they interacted with older adults. The Cronbach's α was 0.70 in the present study.

Negative Stereotype

The self-stereotyping scale adapted by Dang et al. (2020) was used to measure younger adults' negative stereotypes toward the older generation. The first-person appellations (i.e., *I*) in the items were all changed to third-person appellations (i.e., *older adults*) to adjust the scale to the needs of the current study. There were 10 items on the scale (e.g., "Many older adults are just living in the past"). Response options were 1 = *not at all* to 4 = *very much*. The higher total scores illustrated a higher level of negative stereotypes toward older adults. The internal consistency of the scale in the research of Dang et al. (2020) was 0.70, and in this study, it was 0.79.

Perspective-Taking

The current study used the same scale in Study 1 to measure PT. The Cronbach's α was 0.73 in this study.

Procedure

Because Study 2 focused on younger adults' cognition (PT), personal experience (prior contact), emotion (intergroup anxiety), and attitude (stereotypes) toward the older generation, all participants were asked to view two facial pictures of older adults (the same male and female pictures, which were used in Study 1) to activate their perceptions of age-based out-group relations before filling out the questionnaires. Once again, the identity similarity was evaluated by a 7-point Likert scale. The PT scale, the intergroup anxiety scale, the older adults' stereotype scale, and the prior contact scale were completed in turn.

Data Analysis

Study 2 aimed at unveiling the mechanism by which younger adults' previous contact affects their PT toward older adults by

analyzing the pathways in the hypothetical model. To verify the second to the sixth hypotheses suggested in the introduction, Study 2 constructed a moderating mediation model. The mediator in the relationship between prior contact and PT was stereotyping, and the moderator was intergroup anxiety. The present study used SPSS 21.0 to conduct ANOVAs and other statistical methods to analyze the collected data.

Results

Preliminary Analyses

The results of the one-sample *t*-test showed that the scores of similarity were significantly lower than the average point, which was 4, $M = 3.00$, SD = 1.83, $t = -7.76$, $p < 0.001$, Cohen's $d = 0.55$. These results indicated that the participants had a low level of age identification toward the older adults in the facial images.

Mean and SD of all measured variables are presented in **Table 1A**. Due to the fact that gender was significantly related to stereotypes of older adults and intergroup anxiety, an independent-sample *t*-test was conducted. The results indicated that male younger adults had more negative stereotypes ($M_{male} = 26.56$, $SD_{male} = 5.95$, $M_{female} = 24.42$, $SD_{female} = 4.65$, $t = 1.97$, $p = 0.06$, Cohen's $d = 0.03$) and more anxiety ($M_{male} = 39.85$, $SD_{male} = 9.91$, $M_{female} = 34.91$, $SD_{female} = 6.05$, $t = 2.80$, $p < 0.001$, Cohen's $d = 0.07$) toward older adults compared to women younger adults. Thus, in the following statistical analyses, gender was controlled as a covariate. In the case of a potential influence of age toward the core variables, age was controlled as well.

The correlation results revealed that stereotypes of older adults were negatively related to PT ($r = -0.25$, $p < 0.001$), which suggests that younger adults who held more negative stereotypes had more difficulties in taking older adults' perspective. As expected, the quantity of contact was positively related to PT ($r = 0.26$, $p < 0.001$) and indicated that younger adults who had more prior contact with older people found it easier to take the older generation's perspective. Moreover, the quantity of prior contact was negatively related to stereotypes of older adults ($r = -0.15$, $p = 0.03$), which indicated that younger adults who had less prior contact held more negative stereotypes toward older people.

The Mediating Role of Stereotyping

The current study conducted stepwise regression and bootstrap analysis to test the mediation effect of negative stereotypes of older adults while controlling gender and age (see **Table 1B**). The results of equation 1 show that younger adults who previously had more contact with older adults were more easily able to take older adults' perspectives; this supports H3. The results of equation 2 also showed that younger adults who had more contact experience with older adults held a lower level of negative stereotypes. The results of equation 3 not only verified that younger adults who had more negative stereotypes toward older adults found it more difficult to take their perspective (supporting H2) but also confirmed the mediating role of stereotypes in the relationship between prior contact and PT (supporting H4). Specifically, younger adults who previously had had less contact experience with the older generation held more negative stereotypes toward them, which consequently disrupted the ability of younger adults to take the perspective of older people.

The Moderated Mediating Role of Intergroup Anxiety

We used the SPSS-PROCESS v3.3 plug-in unit (Model 59) to analyze the moderating role of intergroup anxiety in the hypothetical mediation model while controlling gender and age (see **Table 1C**). The results of equation 1 demonstrated that the interaction of prior contact and intergroup anxiety significantly predicted negative stereotypes of older adults ($\beta = 0.10$, $t = 2.29$, $p = 0.02$). We then conducted a simple slope analysis by dividing intergroup anxiety into higher (one SD above the mean) and lower (one SD below the mean) level groups to further test the moderated mediation effect (see **Figure 3**). The results showed that the mediation effect of a lower level of intergroup anxiety was -0.27, 95% CI = (-0.44, -0.11), which implied that a lower level of intergroup anxiety moderated the negative prediction of prior contact on stereotyping, meaning that, in the condition of low intergroup anxiety, younger adults who previously had less contact with older adults held more negative stereotypes of older adults compared to those who had more frequent contact. Meanwhile, in the condition of high intergroup anxiety, younger adults held more negative stereotypes regardless of whether they had more or less contact with older adults.

The results of equation 2 showed that intergroup anxiety negatively predicted PT ($\beta = -0.30$, $t = -3.34$, $p = 0.001$), which indicates that younger adults who had a higher level of intergroup anxiety had more difficulty taking older adults' perspective than those who had a lower level of anxiety. In addition, the interaction of stereotypes of older adults and intergroup anxiety positively predicted PT ($\beta = 0.18$, $t = 3.79$, $p < 0.001$). Simple slope analysis (using the same method that was mentioned above to divide the participants into groups with a higher versus lower level of intergroup anxiety) illustrated that the mediating effect of low intergroup anxiety was -0.34, 95% CI = (-0.52, -0.16). Together, we inferred that, in the condition of low intergroup anxiety, younger adults who held a lower level of negative stereotypes took older adults' perspective more easily. However, in the condition of high intergroup anxiety, the results showed a similar pattern to the impact of prior contact on stereotyping, meaning that younger adults who held a higher or a lower level of negative stereotyping would always find it difficult to take older adults' perspective.

The moderating effect of intergroup anxiety on the relationship between prior contact and PT failed to meet the level of significance. In sum, the results for the moderated mediation effect partially supported H5. In particular, intergroup anxiety moderated the relationships between prior contact and stereotyping (H5b) and between stereotyping and PT (H5c), but not between prior contact and PT (H5a). The practical moderated mediation model is presented in **Figure 3B**.

Impact of Quality of Prior Contact on PT

According to the valence of prior contact, we divided participants into a positive contact group ($N_{positive} = 145$), a negative contact group ($N_{negative} = 21$), and a neutral contact group ($N_{neutral} = 34$). UNIANOVA results showed that the main effect of valence was

TABLE 1A | Descriptive statistics and correlations between variables.

Variables	M	SD	1	1a	1b	2	3	4	5	6
1. Prior Contact	21.26	5.60	1							
1a. Quantity of Contact	16.25	4.93	0.98***	1						
1b. Quality of Contact	5.01	1.18	0.64***	0.48***	1					
2. Stereotypes	24.79	4.95	−0.15*	−0.14*	−0.13	1				
3. Intergroup Anxiety	35.75	7.08	0.002	0.01	−0.05	0.49***	1			
4. Perspective-Taking	25.03	4.08	0.26***	0.22***	0.31***	−0.25***	−0.22**	1		
5. Gender			0.06	0.03	0.13	−0.16*	−0.26***	0.11	1	
6. Age	21.54	3.07	−0.10	−0.09	−0.13	0.12	0.01	−0.03	−0.03	1

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 1B | The mediation effect of stereotypes.

	Equation 1 (Perspective-taking)				Equation 2 (Stereotypes)				Equation 3 (Perspective-taking)			
	β	*t*	95%CI		β	*t*	95%CI		β	*t*	95%CI	
			LL	*UL*			*LL*	*UL*			*LL*	*UL*
Variables												
Quantity of contact	0.22	3.16**	0.05	0.32	−0.13	−1.83	−0.31	0.04	0.19	2.82**	0.03	0.28
Stereotypes									−0.23	−3.29**	−0.30	−0.07
Gender	0.10	1.50	−0.20	2.45	−0.41	−2.23*	−4.17	0.17	0.19	1.03	−0.62	2.12
Age	−0.01	−0.11	−0.30	0.19	0.03	1.42	−0.01	0.51	0.04	0.19	−0.23	0.20
Statistics												
R^2	0.06				0.05				0.10			
F	4.25*				3.77*				5.70***			

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 1C | The moderated mediation effect of intergroup anxiety.

	Equation 1 (Stereotypes)			Equation 2 (Perspective-taking)		
	β	*t*	*p*	β	*t*	*p*
Effects						
Quantity of contact	−0.17	−2.69**	0.01	0.12	1.70	0.09
Intergroup anxiety	0.41	5.90***	<0.001	−0.30	−3.34***	0.001
Quantity of contact × Intergroup anxiety	0.10	2.29*	0.02	−0.05	−0.82	0.41
Stereotypes				−0.16	−2.05*	0.04
Stereotypes × Intergroup anxiety				0.18	3.79***	<0.001
Gender	−0.06	−0.38	0.70	0.17	0.92	0.36
Age	0.03	1.69	0.09	0.01	0.45	0.65
Statistics						
R^2	0.29			0.18		
F	16.22***			6.98***		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

significant ($F = 4.31$, $p = 0.02$, $\hat{?}^2 = 0.04$). *Post hoc* tests indicated that the PT of the positive contact group ($M_{positive} = 25.52$, SD = 4.14) was significantly higher than that of the negative contact group ($M_{negative} = 23.19$, SD = 4.00, $p = 0.01$, Cohen's $d = 0.57$) and marginally higher than that of the neutral contact group ($M_{neutral} = 24.06$, SD = 3.37, $p = 0.06$, Cohen's $d = 0.39$). There were no statistically significant differences between the negative contact group and the neutral contact group ($p = 0.44$). These results demonstrated that positive prior contact improved the ability of younger adults to take older adults' perspective.

Discussion

In the current study, we constructed a moderating mediation model to examine the impact of prior contact on PT through different functions of stereotyping and intergroup anxiety. We found it important to note that younger adults

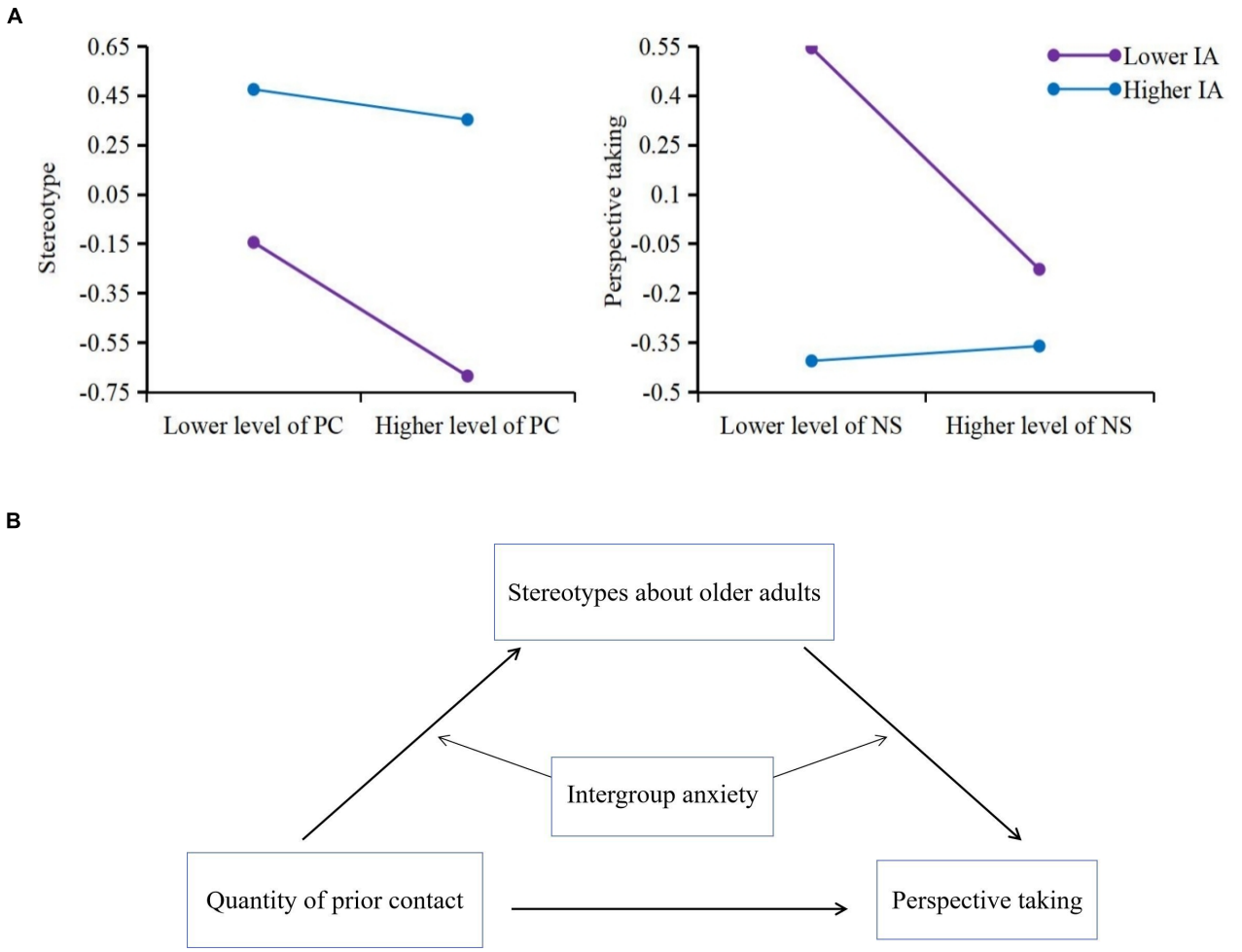

FIGURE 3 | (A) Simple slope diagrams in the practical model. PC, prior contact; NS, negative stereotyping; IA, intergroup anxiety. The diagram on the left presents the moderating effect of intergroup anxiety toward the relationship between prior contact and negative stereotypes of older adults, whereas the diagram on the right presents the moderating effect of intergroup anxiety toward the relationship between negative stereotypes of older adults and PT. **(B)** The practical model diagram.

may take older adults' perspectives based on their negative stereotypes toward them. Specifically, younger adults' negative stereotypes toward older adults decreased their ability to take the older generation's perspective. These empirical findings indicate the importance of younger adults' prior contact with the older generation. This is consistent with the view of Verhage et al. (2021) that younger adults' prior contacts may show a unique contribution to understand the outcomes of intergenerational contact.

We then investigated the mediating role of stereotyping. The more prior intergenerational contact younger adults experienced, the lower the level of negative stereotypes they held toward older adults. Furthermore, we found that negative stereotypes mediated the relationship between prior contact and PT. The moderating role of intergroup anxiety was also tested; the results partially supported H5; in that, intergroup anxiety influenced the relationships between prior contact and stereotyping (H5b) and between stereotyping and PT (H5c), but not between prior contact and PT (H5a).

Combining the results of correlation analyses, regression analyses, and variance analyses, we could also infer that a higher quantity of contact and of positive contact positively predicted a higher level of PT. This indicated that a higher quantity of contact and a more positive quality of contact improved the ability of younger adults to take older adults' perspective. These results were consistent with those of Aberson and Haag (2007). The present study not only showed that intergroup contact will not necessarily facilitate PT unless it has a positive valence and high frequency but also expanded this point of view to intergenerational relationships. It is insightful to learn that the properties of prior contact may be critical to developing harmonious intergenerational relationships through PT, which is a unique process in human–social interaction.

In all, the results of Study 2 demonstrated that a high quantity of positive intergenerational contact improved the ability of younger adults to take older adults' perspective. However, we cannot change past experience; in that, the quantity and quality of prior intergenerational contact cannot be changed. The

manipulation of positive imaginary intergenerational contact seems more practical.

STUDY 3: THE IMPACT OF IMAGINED INTERGENERATIONAL CONTACT ON AGE-BASED OUT-GROUP PT

Methods

Participants

A power analysis conducted in G*power (version 3.1.9.7) indicated that a minimum sample size of $N = 220$ was required to achieve a sufficient power ($1 - \beta = 0.95$) with a medium effect size of $f = 0.20$. Participants were recruited from two universities in Shaanxi Province. A total of 215 college students ($M_{age} = 21.06$, SD = 1.75, 131 men) took part in the survey and were randomly assigned to either the imagined contact group ($N_{imagined} = 107$) or the control group ($N_{control} = 108$).

Manipulation of Imagined Intergenerational Contact

The current study employed an imagined depiction task, asking the participants to depict their imagined pictures of positive interactions with an older adult (imagined intergenerational contact group) or beautiful scenery (control group) for 3 min. After imagining, participants in the imagined contact group were asked to write down as many words as possible that portray older adults' positive traits, whereas the control group was asked to write down as many words as possible that portray the sight of beautiful scenery. The researchers recruited three well-trained psychology major undergraduate students to assess the content's consistency of both groups' answers. The inter-rater reliability was acceptable (Cronbach's $\alpha = 0.78$), which indicated that both groups indeed followed the requirements to imagine corresponding events and wrote down corresponding words. In other words, the manipulation of imagined intergenerational contact was effective and reliable.

Instruments

Perspective-Taking

The same PT scale that was used in Study 1 and Study 2 was also employed in the current study, although with some adaptation to adjust for the manipulation of imagined intergenerational contact. The terms that describe the frequency of events (e.g., *usually*, *sometimes*, and *often*) in the original scale were not suitable for the current study. Therefore, the authors deleted all this type of term and added the word *now* in each statement to properly emphasize the imagined contact events' impact on PT (e.g., "I try to understand older adults better now by imagining how things look from their perspective"). The adapted scale had an acceptable internal consistency (Cronbach's $\alpha = 0.64$), and confirmative factor analysis demonstrated a good validity ($\chi^2 = 27.98$, $\chi^2/df = 2.00$, RMSEA = 0.07, CFI = 0.92, TLI = 0.88, and SRMR = 0.05).

Stereotypes and Intergroup Anxiety

We also measured stereotypes of older adults (Cronbach's $\alpha = 0.80$) and intergroup anxiety (Cronbach's $\alpha = 0.72$) by using the same scales that were employed in Study 2. In the statistical analyses conducted below, we controlled stereotypes of older adults and intergroup anxiety as covariates.

Results

Preliminary Analysis

Descriptive statistics, correlations, and independent-sample *t*-test results are shown in **Table 2**. None of the three variables had statistically significant differences between the two participant groups. However, the results of correlation analysis demonstrated that both stereotyping and intergroup anxiety correlated with PT in similar ways (see **Table 2**). In the imagined group, both stereotyping and intergroup anxiety were significantly correlated to PT in ways similar to those that were presented at Study 2. In the control group, stereotyping was still positively correlated with PT, and intergroup anxiety was still negatively correlated with PT. However, the correlation between stereotyping and PT failed to reach the level of significance. Because the aim of Study 3 was to investigate the intervention effect of positive-imagined intergenerational contact toward PT, it was not our intention to include the variables (which in this case were stereotyping and intergroup anxiety) that may influence the mechanism of this process. Therefore, we controlled stereotype and intergroup anxiety as covariates.

Test of Differential in Perspective-Taking

After controlling stereotypes of older adults and intergroup anxiety, we conducted UNIANOVA to test the differentiation between the PT scores of the two groups. The results showed that the PT of the imagined contact group ($M_{imagined} = 26.05$, SD = 3.53) was significantly higher than that of the control group ($M_{control} = 24.60$, SD = 3.88), $F(1, 73) = 5.24$, $p = 0.03$, $\eta^2 = 0.05$. This indicated that, compared with the participants who imagined scenery, younger adults who imagined positive intergenerational contact took the perspective of older adults more easily, supporting H6.

Discussion

The present study aimed at examining the impact of imagined contact on PT toward age-based out-group targets. More specifically, the intergenerational relationship was significantly improved through increased PT after younger adults imagined positive encounters. This result was consistent with prior research (e.g., Harwood et al., 2015; Chen et al., 2016). Imagined intergroup contact is considered to be an effective way to improve out-group PT (see Husnu and Crisp, 2015). It is similarly effective for intergenerational relationships. As argued above, human imagination makes a great contribution to the shaping process of individuals' perceptual references to other social groups (Crisp and Turner, 2009). The imagination can even make individuals believe that imagined positive encounters with out-groups truly happened in real life (Frye and Lord, 2009). Interestingly, the correlations between stereotypes of older adults, intergroup anxiety, and PT in the current study showed similar patterns to those demonstrated in Study 2, which also indirectly proved the

TABLE 2 | The results of descriptive statistics, correlations, and differential analysis.

Variables	Imagined group				Control group				*t*	Cohen's *d*
	M ± SD	Correlations			M ± SD	Correlations				
		1	2	3		1	2	3		
1. Stereotypes	24.38 ± 3.47	1			24.07 ± 4.41	1			0.57	0.08
2. Intergroup anxiety	28.91 ± 6.83	0.40***	1		28.84 ± 7.66	0.22*	1		0.07	0.01
3. Perspective-taking	25.58 ± 2.99	−0.40***	−0.33***	1	25.24 ± 3.67	−0.12	−0.32***	1	0.75	0.10

*$p < 0.05$, ***$p < 0.001$.

idea that imagined contact has an impact on intergroup relationships in the same way as authentic contact. In this case, younger adults may benefit from imagined contact with older adults that improves their cognition (PT), and thus improves intergenerational relationships.

GENERAL DISCUSSION

The present research conducted three independent studies to investigate the impact of intergenerational contact on younger adults' PT toward older adults. The goal of Study 1 was to examine whether age-based intergroup relations influenced younger adults' PT toward the older generation. Study 2 aimed at investigating the mechanism by which prior contact affects PT toward older adults through the mediating role of negative stereotypes of older adults and the moderating role of intergroup anxiety. Study 3 was an attempt to intervene in younger adults' perceptions of intergenerational relationships by imagining positive contact with older adults. All hypotheses were supported or partially supported, indicating that intergenerational contact is an important tool for influencing younger adults' cognitive (PT), emotional (intergroup anxiety), and attitudinal (stereotyping) factors that are critical to developing harmonious intergenerational relationships.

The results of Study 1 verified a social situation that cannot be ignored. That was to say, the younger generation had more difficulties in taking the older generation's perspective, confirming the existence of the phenomenon called the *generation gap*. Although in Chinese traditional culture, the Confucian principles of filial piety shape Chinese younger adults' more positive attitudes toward older adults to a greater extent than is the case for younger adults in Western culture (Tan and Barber, 2020), the generation gap still exists in daily life. This gap probably comes from the nature of social classification. Based on the social identity theory, individuals prefer to integrate their self-concept into the social group they identify with, classifying themselves as part of the in-group (Chen and Cui, 2015). This means that individuals often use their own psychological state as a reference to infer the mental state of similar others or in-group members (Ames, 2004). Moreover, from the perspective of age and generations, individuals who are of the same generation have a similar social environment, life experiences, and shared values. These similarities become key to increasing in-group identification and favoritism (e.g., Henderson-King et al., 1997; Shi and Tang, 2015). Thus, when younger adults take their contemporaries' perspective, they show the tendency of in-group favoritism based on their shared identity with in-group members. On the other hand, differences between self and the out-group become the main reason for intergroup conflicts and prejudice.

Finding the causes of intergroup differences and their mechanism may be an effective way to eliminate intergenerational conflicts. Thus, it is necessary to further investigate the mechanism behind this social phenomenon and to find interventions to improve intergenerational relationships. Study 2 aimed at solving this problem. It was found that negative stereotypes of older adults not only negatively predicted PT but also mediated the relationship between prior contact and PT, adding effective empirical evidence to the intergenerational relationship research field. Our results were consistent with those of Galinsky et al. (2008), which indicated that individuals utilize stereotypical information when taking out-group members' perspectives. We also agreed with the idea of the "anchor" (Baryshevtsev et al., 2020); in that, when younger adults put themselves in the place of older adults, their original perceptual framework toward older adults is activated to meet the standard of PT. It should be noted that this activated perception framework is beneficial for the whole group of the older generation rather than for an individual. On this basis, the receiver of younger adults' PT may not be the objective older adult target, but it instead is a reflection of a perceived figure that combines all the characteristics of the older generation that younger adults acknowledge. Then, younger adults imitate this represented figure's mental state and perceive the negative traits from their stereotypes, which consequently makes it difficult for them to take the older individual's perspective. In other words, younger adults' failure to take older adults' perspective probably results from the negative stereotypes they apply to the target of their PT. According to this assumption, negative stereotypes may block the ability of younger adults to perceive the target's perspective objectively. As a consequence, younger adults may avoid contact with older adults because of the painful failure of their PT, which in turn may aggravate their negative stereotypes toward older people. This vicious circle is probably responsible for the phenomenon of the generation gap that was found in Study 1. The mechanism behind this relationship should be explored further in future research.

We also found that different levels of intergroup anxiety moderated the mediating relationships through similar paths. In the condition of low intergroup anxiety, only a low level of the antecedent (prior contact or stereotyping) had an impact on the dependent variable. In the condition of high intergroup anxiety, both high and low levels of the antecedent influenced the dependent variable in the same way. These results shed light on the influence of less prior contact toward stereotyping. Previous research has revealed that a lack of intergenerational contact results in more negative stereotypes toward older adults in younger adults' perspective (e.g., Kwong See and Nicoladis, 2010; Jiang and Zhou, 2012; Lytle et al., 2020). The current research confirmed that point of view in finding that prior contact played a part in affecting stereotyping under the condition of low intergroup anxiety. Additionally, the result of a low level of stereotyping predicted a high level of PT under the condition of low intergroup anxiety; this was again consistent with the mediation relationship.

The results for the high intergroup anxiety condition were consistent with Stephan's Intergroup Anxiety Theory (2014), which posits that the negative affections associated with intergroup anxiety could elicit thoughts about the difficulties of intergroup interactions. In this case, high intergroup anxiety increased younger adults' negative stereotyping, whose antecedent was prior contact, and decreased their PT toward older adults, whose antecedent was stereotyping. It is notable that the quantity of contact seems to have little impact on younger adults' stereotyping of older people when they feel more anxious during intergenerational encounters. In other words, in certain conditions, negative emotions, such as anxiety, may be a serious obstacle to the process of building positive intergenerational relationships even when there is ample previous contact. The same circumstances apply to stereotyping. Compared to those who have a higher level of negative stereotypes toward the older generation, younger adults who have a much lower level of stereotyping should have taken the older generation's perspective more easily. Instead, the higher level of intergroup anxiety seems to suppress that positive effect of decreased stereotyping and manages to damage their ability to take the older generation's perspective.

Another type of contact also effectively impacts younger adults' PT toward age-based out-groups: imagined contact. This implies that imagined contact may influence PT through similar pathways to those of authentic contact. Study 3 asked younger adults to imagine positive encounters with older adults and thereby improved their PT. If we were to ask them to imagine a negative interaction with older adults, their PT may be disrupted. Future research might take a closer look at the influence of the valence of imagined contact on intergenerational PT.

A limitation of the present research is that a causal relationship could not be strictly inferred by the current correlation method. There also exists a lack of diversity of ethnic participant groups in the Chinese background, which leads to the limited generalizability of the findings of the present research. Future research might consider cultural differences in intergenerational relationships.

CONCLUSION

In summary, the present research adds empirical evidence to our understanding of the impacts of prior contact, imagined contact, negative stereotypes of older adults, intergroup anxiety, and PT on intergenerational relationships. Chinese younger adults have more difficulties in taking the perspective of older adults than that of their peers. Younger adults who have had less contact with older adults had a higher level of negative stereotyping toward older adults in the condition of low intergroup anxiety, which led to decreased PT toward older adults. In addition, the positive-imagined intergenerational contact will effectively increase younger adults' PT toward older adults.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Shaanxi Normal University Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YL conducted the studies and wrote the manuscript. XJ provided the valuable ideas and the collected data for the manuscript. YW provided the academical support and guidance in preparing the manuscript and granted the research. XZ helped in the collection of the research data. XY granted the research and provided the valuable advice with the manuscript. All authors contributed to the article and approved the submitted version.

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Space-Focused Stereotypes About People Living With HIV/AIDS and the Effects on Community-Approaching Willingness

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Targeting people living with Human Immunodeficiency Virus (HIV), this research examined the prevalence of space-focused stereotypes and their underlying mechanism on behavioral inclinations. Study 1 adopted the explicit nomination and implicit Go/No-Go association tests to explore the existence of space-focused stereotypes of people living with HIV/AIDS. The results demonstrated that space-focused stereotypes were only manifested explicitly with characteristics such as messy, dirty, and gloomy. Study 2 demonstrated a more negative evaluation and community-approaching willingness for communities that include people living with HIV/AIDS than those without HIV/AIDS. Additionally, space-focused stereotypes were found to have an indirect influence on community-approaching willingness; the influence was mediated by both emotional (threat perception) and cognitive factors (community evaluation). These results indicate the deviation of explicit and implicit space-focused stereotypes. More importantly, it revealed that space-focused stereotypes decreased community evaluation and influenced behavioral inclination. This research suggested the existence of space-focused stereotypes on another stigmatized social group. Characteristics of space (e.g., geographical segregation) might be the key to forming space-focused stereotypes.

Keywords: space-focused stereotype, people living with HIV/AIDS (PLWHA), stigmatized group, community-approaching willingness, mediation effect, geographical segregation

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INTRODUCTION

In contrast to the halo effect, which suggests a positive impression of others with only the knowledge of one positive trait, there exists a "jinx effect," which suggests the negative impression of others with only the knowledge of one negative trait. Previous literature has described the space-focused stereotype and demonstrated how people extend their negative stereotypes toward other social groups into their physical space (Bonam et al., 2016). So far, previous studies on space-focused stereotypes have mainly examined stereotypes related to Black Americans (Bonam et al., 2016, 2018). For Black Americans, geographical segregation exists between their and White Americans' living area in the US. However, considering the history of racial segregation in the US, there are complex historical-cultural factors underlying the geographical segregation of Black Americans (Grigoryeva and Ruef, 2015). Thus, previous findings related to space-focused stereotypes could be cultural-specific

(Bonam et al., 2017) and needed to be addressed in other social groups with the nature of geographical segregations. In China, people living with HIV/AIDS (PLWHA) are represented geographically segregated social groups (Qin, 2017). Moreover, similar to Black Americans in the US (Yantis and Bonam, 2021), it is also a stigmatized group perceived as having lower socio-economic status (Li et al., 2008). Therefore, could the space-focused stereotypes also be found in other social groups (e.g., PLWHA) with geographical segregation? Exploring the space-focused stereotypes in PLWHA helped reveal the connection between geographical segregation and space-focused stereotypes more directly.

Stereotypes are a fixed idea or schema toward a specific social group (Fiske, 2004). Numerous researchers in this area focus on how context, including physical and social contexts, influences social cognition (Fiske et al., 1998). Researchers have found an interrelation between physical context and stereotypes (Oishi, 2014; Meagher, 2020); that is, physical context influences the content of stereotypes (Wittenbrink et al., 2001; Trawalter et al., 2012; Motyl et al., 2014), while stereotypes also influence the evaluation of physical objects (Meagher, 2017).

Based on these findings, Bonam et al. (2016) extended the influence of racial stereotypes into physical space and found that negative evaluations of Black Americans' living space further decreased their environmental protection willingness. Their further research found the space-person asymmetry in racial stereotype content and application. That is, stereotypes regarding Black and White Americans' living spaces were stronger than Black and White American people, and space-focused rather than person-focused racial stereotype application is more prominent within Americans (Bonam et al., 2018). Therefore, researchers proposed that space-focused stereotypes are a manifestation of racial stereotypes in space (Bonam et al., 2016, 2018).

Previous studies and findings related to space-focused stereotypes were exclusively based on Black Americans. It is worth noting that the racial segregation between "Black" and "White" has a long history that related to prejudice and bias against Black Americans (Grigoryeva and Ruef, 2015). Thus, the findings of prior work might limit to the US/Western culture (Bonam et al., 2017). As Bonam et al. (2018) have revealed the importance of space characteristics in space-focused stereotypes, we inferred that the existing geographical segregation might be the key to the formation of the space-focused stereotypes, even in other social groups. In addition, methods used in prior research mainly relied on explicit self-report (Bonam et al., 2016, 2018), which could be interference by social desirability (Payne and Hannay, 2021). There is lacking exploration of space-focused stereotypes in implicit measures.

Our present research tried to address the above-mentioned problems in China. Consistent with the geographical segregation characteristics of Black Americans' living space, this research selected another geographically segregated social group in China, the PLWHA. It was well-established that PLWHA tends to cluster in their living areas worldwide (Zulu et al., 2014; Jeefoo, 2016; Chávez, 2021). This pattern is also true in China as the earlier transmission process of HIV (Qin, 2017). In the 1980s, people in villages tried to increase their salary by donating blood, and many were infected due to plasma-collection contamination (Zhang et al., 2006; Yan et al., 2013; Wu et al., 2019). Accordingly, geographical segregation became one of the prominent characteristics of PLWHA. For example, using epidemiological analyses, a study examined the regional differences of HIV/AIDS prevalence in China from 2004 to 2016 and found a significant geographical distribution pattern of HIV/AIDS prevalence in China (Qiao et al., 2019). Moreover, PLWHA is also likely to contact and live with their ingroup (Horvath et al., 2012) and thus create geographical segregation from the majority social groups.

Therefore, the first aim of the present research was to explore people's space-focused stereotypes of PLWHA in China and its influence on people's behavioral inclination. Both explicit and implicit measurements were deployed to amend the deficiency of self-report in a previous study (Bonam et al., 2018). Comparing the characteristics of Black Americans and PLWHA, we predicted a significant negative space-focused stereotype for PLWHA in China, and people tend to avoid contacting the living space of PLWHA for the following reasons.

Black Americans and PLWHA are typical stigmatized social groups in the US and China, respectively (Zhang, 2011; Li et al., 2017; Yantis and Bonam, 2021). Stigma refers to demeaning and insulting labels society imposes on a specific individual or group (Guan, 2007; Zhang and Yu, 2007). As the transmission of HIV is generally connected to specific behaviors such as drug addiction and unprotected sexual behavior, people tend to condemn PLWHA as being morally deficient (Mak et al., 2006; Zhang et al., 2016). In China, although the government announced policies to support PLWHA since 2006 (Wu et al., 2019), biases and prejudices are inevitable once others know an HIV-positive case. For example, PLWHA are more likely to lose their jobs, be rejected when applying to rent a house and become isolated from friends and family (Link and Phelan, 2006; Li et al., 2008; Yang et al., 2021). It is worth noting that PLWHA is different from Black Americans as HIV infections could be hidden from others (concealable stigma; Quinn and Earnshaw, 2013). In this case, although the general public could not identify PLWHA through their appearance, the fact that they are from "AIDS villages" might result in the avoidance inclination within perceivers (Baunach and Burgess, 2013). However, from the perspective of PLWHA themselves, it is a matter of responsible behavior to tell their partners about their infections to prevent the transmission of HIV. Examining the public's negative stereotypes and avoidance behavior is crucial before PLWHA can accept the fact that they are infected.

The second aim of this study was to reveal the mechanism underlying avoidance behaviors toward PLWHA's living space. Consistent with previous literature (Bonam et al., 2016), this research utilized community-approaching willingness to measure avoidance of PLWHA and further investigate its relationship with space-focused stereotypes. Specifically, we used community-approaching willingness to assess participants' willingness to move their house near a target community. In their investigations of mechanisms underlying a particular behavior, prior researchers have always separated emotion and cognition as

distinct pathways (Akinola and Mendes, 2008; Zuo et al., 2019). Therefore, we also addressed potential emotional and cognitive factors as mediators in the relationship between space-focused stereotypes and community-approaching willingness.

As a systematic bias of social cognition, stereotyping is closely related to cognitive factors (Zuo et al., 2006) that evoke emotional reactions and prejudiced behaviors (Cuddy et al., 2008). The emotional reactions for PLWHA have been well evidenced in previous research. For example, people demonstrated negative emotions toward PLWHA and were afraid of getting infected and, subsequently, avoided contact with PLWHA (Berger et al., 2001; Popova, 2007; Pickles et al., 2009; Polonsky et al., 2015). Thus, the threat of HIV infection could be the reason for negative attitudes toward PLWHA. For the present research, threat perception was predicted to mediate the relationship between space-focused stereotypes and behavioral inclinations; feelings of threat, fear, and anxiety were indicators of threat perception (Zheng and Zhao, 2016).

Regarding cognitive reactions, the evaluation of the community environment was the critical cognitive factor in assessing the living space of a stigma social group (Bonam et al., 2016). Similar to Black Americans, PLWHA is also perceived as having a lower socio-economic status (Link and Phelan, 2006; Li et al., 2008; Yang et al., 2021). Therefore, this research also measured community evaluation through items related to the general socio-economic conditions. We assumed that community evaluation might significantly mediate the influence of space-focused stereotypes on community-approaching willingness.

In conclusion, this study has two aims. First, we examined the space-focused stereotypes in evaluations of PLWHA by focusing on both explicit (Study 1A) and implicit stereotypes (Study 1B). Second, this study investigated the influence of space-focused stereotypes on behavioral inclinations and furthered the possible mediation effects of emotional and cognitive factors (Study 2).

STUDY 1: SPACE-FOCUSED STEREOTYPES OF PLWHA

Study 1 aimed to explicitly and implicitly test space-focused stereotypes of PLWHA. Study 1A used a self-reported method to investigate explicit space-focused stereotypes of PLWHA, and Study 1B used the Go/No-Go association test (GNAT) to measure implicit space-focused stereotypes of PLWHA.

Study 1A: Explicit Measures of Space-Focused Stereotypes

Participants

A total of 87 students (M_{age} = 19.72, SD = 0.96) were recruited from a university in Wuhan, China, including 19 males and 68 females. A sensitivity analysis revealed that, at a critical alpha of 0.05, the sample size (87) had a conventional 80% power to detect small effects of d = 0.27 in a one-sample t-test. All participants volunteered to participate in the study and provided informed consent before the formal testing. None of the participants were excluded because of the validity of their responses.

Procedures and Materials

The data was collected through an online survey platform[1] in China. This study was carried out following the recommendations of the American Psychological Association (APA) ethical guidelines, and the protocol was approved by the Ethics Committee of Central China Normal University. All participants provided informed consent before the formal experiment was conducted. The informed consent form included a brief description of our study, the confidentiality of their data (i.e., regarding remaining anonymous in any publication related to this study), and their rights to withdraw from the experiment at any time. Researchers' contact information was also provided so that participants could inquire about any further details of the study. After reading the consent form, the participants indicated their willingness by checking the "I agree" option. The informed consent procedure was identical for all the following studies.

In the formal testing, the participants completed a questionnaire consisting of a free association test and a space-focused stereotype measurement after they had submitted the consent forms.

The free association test asked participants to generate at least five characteristics describing PLWHA's living space in China. Then, the participants were asked to evaluate the valence of each character they generated, from −3 (very negative) to 3 (very positive). Additionally, the participants also evaluated the extent to which the public agrees to each characteristic on an 11-point Likert scale (0 = strongly disapprove, 10 = strongly approve). The evaluated consensus of the public also indicates the participants' confidence in each character.

The measurements of space-focused stereotypes of PLWHA were revised from Bonam et al. (2016), including three positive and four negative items related to living spaces. This approach was applied in the present research because, similar to some other groups, such as Black Americas, PLWHA are also being perceived as economically disadvantaged (Li et al., 2008; Cui et al., 2017; Yang et al., 2021), and previous studies of space-focused stereotypes have also included items related to socioeconomic status. The three positive items we used were: *great access to banks or savings and loan institutions*, *well-kept houses and properties*, and *great neighborhood shopping*. The four negative items were: *poor neighborhood safety*, *poor city services* (e.g., street cleaning or garbage collection services), *industrial facilities nearby* (e.g., power plants and incinerators), and *low-quality public schools*. All the items were translated and back-translated from English to Chinese by two individuals fluent in both languages. The participants were asked to rate items about the living area of a person with HIV-AIDS on a 10-point Likert scale (1 = highly inconsistent, 10 = highly consistent). The Cronbach's α of the scale was 0.79, which suggested the reliability of this result.

Coding

Three coders who did not know the study's purpose were asked to encode the participants' generated characteristics of PLWHA's living space. First, the coders had to distinguish the features describing spaces from those describing the PLWHA themselves.

[1] www.wjx.com

Then, the coders had to encode the characteristics that described the living space into different categories according to their meanings. Finally, the coders checked their coding categories with each other. For inconsistent coding, the coders discussed them until they reached a consensus.

Results of Coding

All the collected characteristics were originally written in Chinese and translated into English in the main text. The participants nominated a total of 697 words that described the characteristics of PLWHA's living space; 632 validated characteristics remained after the coding procedure. Excluded characteristics were those that described the personality of PLWHA and their feelings about PLWHA. The classified characteristics accounted for 90.7% of all characteristics. The coding procedure generated 13 categories of negative space descriptions (452 negative characteristics) and seven categories of positive space descriptions (121 positive characteristics). Six categories (59 characteristics) were categorized as neutral. The top ten categories ranked by the number of characteristics are listed in **Table 1** (see **Supplementary Table 1** in **Supplementary Materials** for all categories, and **Supplementary Table 3** for categories in Chinese). The sum of characteristics in the top ten categories accounted for 66.9% of the validated characteristics.

Valence and Consensus of the Characteristics

The valence and evaluated consensus of the coded categories were analyzed using SPSS 27.0. Each participant averaged the valence of the characteristics they generated, thus creating their attitudes toward PLWHA's living space. Most participants (71.52%) perceived the living space of PLWHA as negative (statistical significantly lower than 0), χ^2 (1, N = 87) = 5.16, p = 0.02, Φ = 0.06.

Then, the valence was averaged across all validated characteristics; it was found that the participants had negative space-focused stereotypes of PLWHA overall, M = −0.73, SD = 1.83, $t(610)$ = −9.89, $p < 0.001$, Cohen's d = −0.40. By calculating the mean valence of the top ten categories, the results demonstrated that except for the positive categories of clean and tidy (see **Table 1**), other categories were all negative ($p_s < 0.01$). Additionally, there was a significant negative correlation between the number of characteristics within each category and its valence, $r(26)$ = −0.46, p = 0.017; that is, the negative categories were more frequently mentioned by the participants.

For the consensus evaluation, a higher rating indicated the perceived representation of each character. The consensus rating was higher than the midpoint (5), M = 5.63, SD = 2.10, $t(610)$ = 7.38, $p < 0.001$, Cohen's d = 0.30, indicating confidence on their self-generated characteristics. Moreover, there was a significant difference in the consensus between the negative and positive categories, $F(1,610)$ = 8.43, p = 0.004, η^2 = 0.014. Further analysis demonstrated that the participants perceived the negative categories as more representative, M = 5.77, SD = 2.09, compared with positive categories, M = 5.21, SD = 2.09.

Space-Focused Stereotypes of PLWHA

Using the scale developed by Bonam et al. (2016), the result of one sample t-test (compared to 5.5) demonstrated negative space-focused stereotypes of PLWHA. The stereotyping was especially illustrated in the evaluation of public safety, city services, school quality, financial institutions, and houses and property conditions (**Table 2**).

Study 1B: Implicit Measurement of Space-Focused Stereotypes

Participants

The G*power 3.1 was used to calculate the sample size for this experiment; it demonstrated that for the medium level of effect size (Cohen's d = 0.45-0.55) with 0.05 significant level (two tails), 28 to 41 participants were needed to detect the power of 0.8 in a paired-sample t-test. Therefore, a total of 43 participants were recruited (14 males and 29 females, M_{age} = 19.79,

TABLE 1 | Coded categories of space-focused stereotypes on PLWHA and their corresponding valences and evaluated public consensus.

Category	Examples	n[a]	Valence			Consensus		
			M (*SD*)	*T*	Cohen's *d*	*M* (*SD*)	*T*	Cohen's *d*
Mess	chaos, disorder	62	−1.73 (1.30)	−10.49***	−1.33	5.66 (2.23)	2.33*	0.30
Dirty	unsanitary, dirty	57	−2.14 (1.26)	−12.83***	−1.70	6.09 (2.39)	3.43**	0.45
Dark	dark, gloomy	54	−1.44 (1.62)	−6.55***	−0.89	4.98 (2.19)	−0.06	−0.01
Narrow	narrow, small	52	−1.19 (1.07)	−8.06***	−1.12	5.46 (1.91)	1.74	0.24
Chilly	white, empty	39	−0.87 (0.89)	−6.09***	−0.95	5.53 (1.84)	1.76	0.29
Isolation	isolated, quarantined	37	−1.84 (1.14)	−9.78***	−1.63	6.50 (2.11)	4.37***	0.71
Clean	clean, germfree	35	1.77 (1.09)	9.64***	1.63	5.40 (2.32)	1.02	0.17
Remote	secluded, remote	30	−0.90 (1.40)	−3.53***	−0.64	6.50 (2.03)	4.05***	0.74
Dilapidated	poverty, shabby	29	−1.52 (1.24)	−6.58***	−1.22	6.03 (1.66)	3.36**	0.62
Neat	organized, orderly	28	1.79 (1.32)	7.18***	1.36	4.96 (1.77)	−0.11	−0.02

[a] *The total number of characters generated by participants.*

****p < 0.001, **p < 0.01, *p < 0.05.*

The characteristics and categories listed in this table were translated from Chinese. Please see ***Supplementary Table 3*** *in* ***Supplementary Materials*** *for their initial Chinese version.*

TABLE 2 | Explicit measurement of space-focused stereotypes on PLWHA.

Items	*M*	*SD*	*T*	Cohen's *d*
Poor neighborhood safety	6.29	2.20	3.33**	0.36
Poor city services (e.g., street cleaning or garbage collection)	6.23	2.17	3.14**	0.34
Industrial facilities nearby (e.g., power plants and incinerators)	5.31	2.00	−0.88	−0.10
Low quality public schools	6.23	2.18	3.12**	0.34
Great access to banks or savings and loan institutions	5.01	2.02	−0.26*	−0.24
well-kept houses and properties	4.36	1.98	−5.38***	−0.58
Great neighborhood shopping	5.15	2.15	−1.52	−0.16
All items [a]	6.08	1.41	3.83***	0.41

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.
[a]All items indicate the averaged rating on above seven items, the ratings on positive items were reversed so that a higher rating means a more negative space-focused stereotype.

SD = 2.86). As the implicit measurement was a single-category-GNAT, participants' responses were preliminarily analyzed to select qualified data from the sample (Nosek and Banaji, 2001). The procedures of the preliminary analysis were as follows: (a) The rate of hit and false alarm of each participant was calculated and then converted into *z-scores*; (b) The sensitivity *d'* score for the single category was calculated by subtracting the hit rate from the rate of false alarm; finally, (c) Participants with a *d'* score less than zero were eliminated, which meant they were not fully involved in the experiment. According to the preliminary analysis, two males were excluded, so the final sample size was 41 (12 males and 29 females, M_{age} = 19.88, *SD* = 1.90). For the rest of the participants, their *d'* scores were higher than 0 (*M* = 19.88, *SD* = 1.90), and their average accuracy was 83.69%.

Materials

GNAT is a traditional paradigm used to measure implicit attitudes or beliefs. It reflects potential attitudes toward categories through the difference in reaction time and accuracy between congruent pairings (category and attributes that are stereotypically consistent) and incongruent pairings (category and attributes that are stereotypically inconsistent). GNAT was suitable for this study because it can measure implicit attitudes toward a single category (Nosek and Banaji, 2001; Wen and Zuo, 2007), in this case, the implicit space-focused stereotypes of PLWHA.

Four kinds of words must be provided in GNAT, including synonyms of target category, control category, positive attributes, and negative attributes (see **Supplementary Table 2** in **Supplementary Materials** for details about attributes). The synonyms of PLWHA and the control category were self-generated. The general public were regarded as the control category based on previous research (Yang et al., 2011). As the present study focused on the implicit space-focused stereotypes, the attributes were positive and negative characteristics generated from Study 1A. Therefore, 10 negative and 10 positive characteristics were selected from the results of the free association test in Study 1A. We recruited another 72 participants (13 males and 59 females, *M* = 25.21, *SD* = 12.12) to evaluate the valence of these characteristics on a 7-point Likert scale (1 = very negative, 7 = very positive). The eight most positive and negative characteristics were selected as the attributes used in Study 1B (see **Supplementary Table 2** in **Supplementary Materials**). The participants' ratings of positive and negative attributes were averaged respectively to compare their differences. The results revealed a significant difference between the positive (*M* = 5.74, *SD* = 0.83) and negative attributes (*M* = 2.59, *SD* = 0.73) on valence ratings, $t(71) = 19.67$, $p < 0.001$, Cohen's $d = 2.31$. The four unselected characteristics were used as attributes in the practice trials of GNAT.

Procedures

The procedure of the single-category GNAT is illustrated in **Table 3**. The GNAT allowed us to examine the connection between PLWHA and spaces describing positive or negative attributes.

The instructions were presented first, followed by the practice trials. The practice trials were conducted several times until the participants understood the experimental procedure. A slide presenting the target category or attribute was illustrated at the beginning of each block, indicating that participants should provide the "go" responses when they see the trials related to the target category or attribute. The feedback of accuracy and response time were only provided in the practice phase. In the formal experiment, the target category or attribute appeared in the upper left or upper right corner of the screen, while the words that needed to be judged were presented in the middle of the screen. The participants were asked to give their "go" or "no-go" responses once they saw the words presented in the middle of the screen. Each word was presented for a maximum of 600 ms, which met the 500–850 ms standard suggested by Nosek and Banaji (2001).

Results

Sensitivity (*d'* score) reflects the ability to distinguish signals from background noise (Nosek and Banaji, 2001). In the GNAT test, the difference in *d'* scores between congruent (target category with negative attributes) and incongruent pairings (target category with positive attributes) indicates whether the connection between congruent pairings is significantly stronger than incongruent pairings. Therefore, a larger difference represents a higher level of stereotypicality.

The results of the present study demonstrated that there was no significant difference in *d'* scores between congruent (*M* = 0.79, *SD* = 0.92) and incongruent pairings (*M* = 0.86, *SD* = 0.93), $t(40) = 0.31$, $p = 0.76$, Cohen's $d = 0.08$. That is, there were no implicit space-focused stereotypes of PLWHA.

TABLE 3 | The procedure of single-category GNAT.

Phase	Reaction targets	Number of trials	Trial ratio of Go:No-Go
Step 1	HIV category words	16	1:1
Step 2	Positive attributive words	16	1:1
Step 3	Negative attributive words	16	1:1
Step 4	HIV category words & Positive attributive words	32	1:1
Step 5	HIV category words & Negative attributive words	32	1:1

Discussion

Study 1A found that the participants have explicit negative space-focused stereotypes of PLWHA. Specifically, participants nominated more negative characteristics and categories than positive characteristics and categories, and negative categories were believed to have a higher consensus among the public. Study 1A also measured the space-focused stereotypes utilizing the scale developed by Bonam et al. (2016). The results also demonstrated the existence of negative explicit space-focused stereotypes of PLWHA. However, the results of Study 1B suggested an insignificant implicit space-focused stereotype of PLWHA. These results revealed negative impressions of not only PLWHA traits, behaviors, and appearances but also their living spaces. Moreover, it is mainly manifested in the explicit rather than the implicit level. The specific reasons for the difference between implicit and explicit space-focused stereotypes will be further discussed in the "General Discussion" section.

STUDY 2: THE INFLUENCE OF THE SPACE-FOCUSED STEREOTYPE ON BEHAVIORAL INCLINATION

Based on Study 1, Study 2 explored how the space-focused stereotypes affect individuals' behavioral inclinations regarding living spaces of PLWHA, with the following two goals. First, it aimed to understand evaluations and behavioral inclinations toward the living spaces of PLWHA versus those without HIV/AIDS. Second, it focused on the space-focused stereotype targeting PLWHA and its behavior pathway to verify the dual-path model of emotion and cognition.

Participants

G*power 3.1 was used to calculate the sample size for this experiment; it demonstrated that for the medium level of effect size (Cohen's d = 0.45-0.55) with a 0.05 significant level (two tails) and an allocation ratio of 2:1, 120 to 178 participants were needed to detect the power of 0.8 in an independent sample t-test. Therefore, a total of 120 undergraduates (35 males and 85 females, M_{age} = 20.08, SD = 1.87) were recruited from a university in Wuhan. The participants were randomly divided into a control group (the evaluation target was people living without HIV/AIDS, 40 participants, of whom 13 were males) and an experimental group (the evaluation target was PLWHA). More participants (80 participants, 22 males) were included in the experimental group to meet the sample size for analyzing the mediation effect.

As with Study 1, all participants joined the study voluntarily, the anonymity and confidentiality of answers were declared to them, and informed consent was obtained before the formal experiments. None of the participants were excluded.

Procedure and Materials

The procedure of this study mainly consisted of two parts, including the measurement of space-focused stereotypes and testing after house-related manipulation. After obtaining informed consent, all the participants were given a questionnaire that tested their space-focused stereotypes of PLWHA. The space-focused stereotypes were measured in the same way as Study 1A, which included seven items rated on an 11-point Likert scale, ranging from 0 to 10 (Bonam et al., 2016). Its Cronbach's α reliability was 0.78.

Following the ratings for space-focused stereotypes of PLWHA, we changed the information between the control and experiment groups. The participants were required to imagine planning to rent a house near their job after finding formal work. Then, information was provided about the house, and the participants were asked to evaluate this house and its surrounding community in terms of threat perception, community evaluation, and community-approaching willingness. Specifically, the participants were given written information on the house owner: "a person living with HIV-AIDs" in the experiment group and "another employee" in the control group. We also presented information about the house in a table to increase a sense of reality for the participants, including house type (flat), floor (third in a seven-floor building), area (85 m^2), rooms (one living room, two bedrooms, one kitchen, and one bathroom), and orientation (South). The specific information about the house was consistent across the experiment and control groups. Afterward, the participants needed to rate their threat perception, community evaluation, and community-approaching willingness based on given information about the house.

The measurement of threat perception was based on previous research, which selected the feelings of threat, fear, and anxiety as indicators (Zheng and Zhao, 2016). The participants rated the intensity of their emotions when facing PLWHA on a 5-point Likert scale (Cronbach's α = 0.88).

The community evaluation was conceptualized as an objective evaluation of the community based on information about the house and house owner. Its items were adapted from the test of space-focused stereotypes using generic language, including *community service*, *house and facility maintenance*, *nearby school quality*, *community safety*, *shopping convenience*, *and bank accessibility* (Cronbach's α = 0.81). For this measurement, items seem to tap into community socio-economic status perceptions. Previous literature demonstrated the connection between PLWHA and their socio-economic status (e.g., Li et al., 2008; Cui et al., 2017); we speculated that Bonam's approach could reflect participant's space-focused stereotypes in a specific way. Comparing the items from the space-focused stereotypes, the generic items from community evaluations increase categorical and abstract thinking (Rhodes et al., 2018) and allow participants to rate the community in a more objective form. A 7-point Likert scale was applied, ranging from 1 (extremely poor) to 7 (extremely good).

The evaluation of their community-approaching willingness consisted of two items (rated on a 5-point Likert scale, 1 = entirely negative, 5 = entirely positive). One required the participants to evaluate their willingness to move to the community where the house was located, and the other required them to evaluate their satisfaction with the community if they lived in it (Cronbach's

α = 0.85). Finally, we collected the participants' demographical information, including age and gender.

Results

Influence of House Owner Type on Community Evaluation

The independent sample *t*-test was used to analyze the difference between the experimental and control groups in community evaluation and community-approaching willingness. It was found that the community evaluation of the control group (M = 4.96, SD = 0.97) was significantly higher than that of the experimental group (M = 4.13, SD = 0.70), $t(118) = 5.38$, $p < 0.001$, Cohen's $d = 1.03$; the community-approaching willingness of the control group (M = 3.51, SD = 0.80) was also significantly higher than that of the experimental group (M = 2.38, SD = 0.87), $t(118) = 6.92$, $p < 0.001$, Cohen's $d = 1.33$. These results indicated a devalued attitude when evaluating spaces related to PLWHA compared to those without HIV/AIDS, and space-focused stereotypes could be the reason for this tendency.

Mediation Analysis of Emotional and Cognitive Factors

The descriptive and correlation results of the variables involved in this study are illustrated in **Table 4**. Although the negative correlation between the space-focused stereotype and community-approaching willingness was not significant, there were significant correlations between the pathways through threat perception and community evaluation. The planned test for the mediation effect was run using the bias-corrected bootstrap method in PROCESS model 4 (Hayes, 2022), and the coefficients between the variables are illustrated in **Figure 1**.

It was found that the direct path from the space-focused stereotype of PLWHA to the community-approaching willingness was not significant, $R^2 = 0.03$, $F(1,78) = 2.60$, $p = 0.111$. However, when threat perception and community evaluation were included in the model, the overall interpretation of this model was significantly improved, $R^2 = 0.36$, $F(3,76) = 14.44$, $p < 0.001$.

A further analysis revealed the mediation effect of threat perception (−0.08) was statistically significant, bootstrap 95% CI = [−0.187, −0.008]. Individuals' space-focused stereotypes of PLWHA positively predicted their threat perception, β = 0.19, SE = 0.08, $t(78) = 2.22$, $p < 0.05$, which led to a decrease in the willingness to approach their related communities, β = −0.30, SE = 0.09, $t(78) = -3.43$, $p = 0.001$. Additionally, the mediation effect of community evaluation was also negatively significant (−0.21), bootstrap 95% CI = [−0.370, −0.086]. That is, the higher the space-focused stereotype, the lower the overall evaluation of community, β = −0.23, SE = 0.06, $t(78) = -3.77$, $p < 0.001$, which further reduces individuals' willingness to approach the community, β = 0.67, SE = 0.12, $t(78) = 5.47$, $p < 0.001$.

Under the influence of threat perception and community evaluation, the coefficient from the space-focused stereotype to community-approaching willingness changed from negatively insignificant, β = −0.13, SE = 0.08, $t(78) = -1.61$, $p = 0.111$, to positively insignificant, β = 0.08, SE = 0.07, $t(78) = 1.11$, $p = 0.207$. That is, space-focused stereotypes influenced community-approaching willingness of PLWHA's living space, and this process was mediated by a cognitive factor (community evaluation) and an emotional factor (threat perception).

TABLE 4 | The descriptive statistics of the space-focused stereotype, threat perception, community evaluation, and community-approaching willingness.

Variables	*M*	*SD*	1	2	3
Space-focused stereotype	6.00	1.21			
Threat perception	3.12	0.95	0.244*		
Community evaluation	4.12	0.70	−0.393***	−0.039	
Community-approach willingness	2.38	0.87	−0.179	−0.318**	0.514***

Discussion

In Study 2, by comparing the community-approaching willingness and the community evaluation of the experimental and control groups, it was found that compared to those without HIV/AIDS, individuals' evaluation of the living space of PLWHA was generally more negative, which was reflected in two aspects: the lower community-approaching willingness and the lower community evaluation. The results also revealed that both threat perception and community evaluation negatively mediated the influence of the space-focused stereotype on individuals' behavioral inclinations. The space-focused stereotype positively predicted individuals' threat perception of PLWHA, thus reducing their willingness to approach the communities. Meanwhile, the space-focused stereotype also negatively predicted individuals' evaluation of PLWHA-related communities, thus reducing their willingness to approach the communities. The results validated the emotional and cognitive dual-path model that space-focused stereotypes affect behavioral inclinations, indicating that space-focused stereotypes of PLWHA would elicit a negative emotional reaction and a negative evaluation of a wider range of physical spaces, leading to avoidance of behaviors.

GENERAL DISCUSSION

This study explored the existence of space-focused stereotypes of PLWHA and the emotional and cognitive mechanisms underlying its behavioral inclinations. Based on the research of Bonam et al. (2016), Study 1A used the free association test and a subsequent survey to explore the content and valence of space-focused stereotypes of PLWHA. The results demonstrated that the participants had negative stereotypes of PLWHA-related spaces, and they would use negative characteristics such as messy, dirty, and gloomy to describe the living space of PLWHA. Additionally, the participants believed that others were more likely to agree with their negative impressions of PLWHA's living space than positive impressions. These results verified the prevalence of negative space-focused stereotypes of PLWHA.

Negative evaluations of living space for PLWHA are strongly associated with their stigma. As suggested in previous literature, stigma towards PLWHA is prevalent worldwide

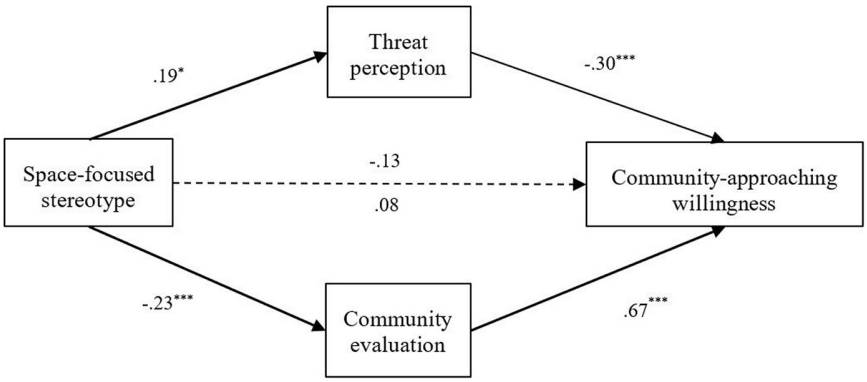

FIGURE 1 | The mediation of threat perception and community evaluation between space-focused stereotype and community-approaching willingness.

(e.g., Jeefoo, 2016; Qin, 2017; Chávez, 2021), which is also a focus of medical and psychological literature (Li et al., 2012; Beaulieu et al., 2014; Ren et al., 2014). In China, people tend to attribute HIV infection to unprotected sexual behavior (Cui et al., 2017). Thus, PLWHA faces harsh and severe criticism of their "immorality" than people with other infectious diseases (Mak et al., 2006; Zhang, 2011). Moreover, characteristics nominated in Study 1A, together with the participants' negative rating on adapted space-focused stereotypes, suggested a lower perception of the socio-economic status of PLWHA, who lose their jobs more frequently and easily, and lack support from others (Link and Phelan, 2006; Li et al., 2008; Yang et al., 2021). It is worth noting that prejudiced perceptions of PLWHA having lower socioeconomic status started to gain popularity in the 1980s (Zhang et al., 2006; Yan et al., 2013; Wu et al., 2019). The negative perception of PLWHA's economic conditions reflects the persistence of stereotypes and the obstacles encountered by many PLWHA nowadays. Additionally, PLWHA are aware of the possible discrimination and prejudice and the consequence on their economic status (Berger et al., 2001). Therefore, they might conceal their infection of HIV from others, which, in turn, threatened the health of their sexual partners.

Study 1B used a single-category-GNAT paradigm to measure implicit space-focused stereotypes and found that the participants do not have negative perceptions of the living spaces of PLWHA. This result was not expected. However, previous studies exploring the relationship between implicit and explicit stereotypes have demonstrated that they are not always consistent (Rudman and Kilianski, 2000; Kornadt et al., 2016; Matthes and Schmuck, 2017), and environmental factors could cause their differences (Brauer et al., 2000; Smyth and Nosek, 2015). Greenwald and Banaji (1995) proposed that explicit attitude was influenced by recent experience, while implicit attitude was more likely influenced by experiences in early childhood. Cultural and emotional experiences are also linked to the development of implicit attitudes (Rudman, 2004).

For the living space of PLWHA, negative attitudes might derive from newspapers and online media (Nanda and Pramanik, 2010), and so, recent experiences were more likely to be influenced. PLWHA is often associated with prostitution, drug abuse, and other risky behaviors in the public media, leading to negative or stigmatizing views of PLWHA (Zhang and Li, 2005). Additionally, risky behaviors are often associated with low socio-economic status, thus reinforcing explicit negative space-focused stereotypes of PLWHA. However, during early childhood, when implicit stereotypes are formed (Greenwald and Banaji, 1995), children might be less likely to be exposed to the concept of PLWHA. They may not effectively obtain knowledge related to PLWHA from newspapers and online media and thus do not form the implicit space-focused stereotype. Most of the existing childhood studies related to HIV/AIDS have been conducted from the perspective of children infected with HIV (for example, Lee and Rotheram-Borus, 2009), and there is a lack of exploration of children's impressions and evaluations of others infected with HIV; therefore, this hypothesis needs further testing. Additionally, the focus on implicit space-focused stereotypes was also one of the innovations of the present research. Whether the neutral attitude on the implicit level was a unique characteristic of the space-focused stereotype needs to be addressed in follow-up studies.

In Study 2, we explored the impact of space-focused stereotypes on behavioral inclinations and their mechanisms. The results demonstrated that, compared to evaluations of those without HIV/AIDS, the participants' evaluations of the living spaces of PLWHA were more negative in terms of community evaluation and community-approaching willingness. Unlike previous research focused on Black Americans (e.g., Bonam et al., 2016; Yantis and Bonam, 2021), this study investigated the space-focused stereotype and its corresponding influence on cognition and behavioral inclinations in another social group with concealable stigma. Although it seems unlikely that people can distinguish PLWHA from non-infected people by appearance, geographical segregation between them does exist worldwide (e.g., Zulu et al., 2014; Jeefoo, 2016; Chávez, 2021), including as in China (Qin, 2017; Qiao et al., 2019; Wu et al., 2019). The results for negative space-focused stereotypes and avoidance behaviors suggest there is a direct relationship between geographical segregation and the cognitive and behavioral response to the segregated space. There seems to be a "mental space" that is generated once a social group is separated from

others. Further research could examine this possibility more directly with novel social groups created by the minimal group paradigm. This approach is especially valuable in the background of the COVID-19 pandemic, as quarantine is regarded as an effective measure to control the transmission of the virus.

For PLWHA, geographical segregation and others' avoidance behavioral inclination are easily detected in their social interactions. In fear of possible social exclusion from others, PLWHA is more likely to conceal their infections, which is irresponsible behavior for their intimate partners and is more likely to result in HIV transmission. Research should continue developing a proper way to intervene the negative evaluation and prejudiced behavior on PLWHA from the public, which is crucial to restrain the prevalence of HIV.

The mediation analysis in Study 2 revealed the mediation effect of threat perception and community evaluation between space-focused stereotypes and community-approaching willingness. For threat perception, higher space-focused stereotypes indicated higher threat perception and further decreased the community-approaching willingness, while higher space-focused stereotypes correlated with a lower community evaluation led to decreased community-approaching willingness. Although the direct relationship between space-focused stereotypes and community-approaching willingness was not significant before and after the inclusion of mediators, the significant mediation effect of threat perception and community evaluation specified the importance of explaining a particular behavior.

The emotional and cognitive pathways are essential mechanisms in explaining behavior. The present research was the first to examine how space-focused stereotypes influence avoidance behavior in China (e.g., Zuo et al., 2019). The factor of community evaluation was considered in Bonam's initial research (Bonam et al., 2016), while it was regarded as an outcome variable rather than a factor that results in behavioral inclination. Conversely, the emotional response was only examined in evaluating the public's feelings of space-focused stereotypes (Coleman et al., 2019). In this research, the statistically negative mediation effect and the insignificant direct effect suggested that people tend to avoid PLWHA's living space when HIV-related information intrigues their emotional and cognitive reactions. For geographically segregated social groups, people might interfere that these groups were separated from the public because they were dangerous or threatening. This kind of perception raises the feeling of threat and negative evaluation for the surrounding environment, thus forming space-focused stereotypes for targeting social groups.

It was also worth noting that the mediation effect of threat perception was not as significant as community evaluation, demonstrated in the bootstrapped 95% *CI* ([−0.187, −0.008] versus [−0.370, −0.086]). There are several reasons for this result. First, the outcome variable of community approaching willingness is targeted to the community. Community is more strongly related to the cognitive mediator (i.e., community evaluation) than to the emotional mediator (i.e., threat perception); hence, it leads to a more prominent mediation effect of the community evaluation. Second, the measure of threat perception included the feelings of threat, fear, and anxiety but omitting disgust, which is more closely related to pathogen avoidance (Schaller and Park, 2011; Yang et al., 2020). The exclusion of disgust may have reduced the mediation effect of threat perception. Finally, apart from the threat, people also feel compassion when evaluating PLWHA (Kuah-Pearce and Guiheux, 2014). This research was mainly conducted with college students. They generally have a more liberal view of sexual behavior than older, more conservative generations (Yu, 2012). Many of the students had received HIV and AIDS education and had been shown to reduce bias towards PLWHA (e.g., Zha et al., 2021). Therefore, the feeling of compassion might moderate their feeling of threat in evaluating PLWHA's living space. Further research could take all these factors into account for a more comprehensive approach to exploring the cognitive and emotional mechanism of people's avoidance behavior regarding PLWHA.

LIMITATIONS AND FURTHER DIRECTIONS

This study is the first to examine space-focused stereotypes in Chinese culture and demonstrates the negative explicit space-focused stereotypes of PLWHA. It also discusses the influence of space-focused stereotypes on behavior and its mechanism, which have important theoretical and practical values. However, some limitations should be addressed in future studies.

One limitation concerns the target group. Although this study extended the space-focused stereotypes from Black Americans to PLWHA, it could not directly prove the universality of space-focused stereotypes. More importantly, the question remains as to whether there are direct connections between geographical segregation and space-focused stereotypes. Therefore, more geographically segregated social groups across cultures should be considered to explore the existence of space-focused stereotypes on these groups of people. Additionally, in light of the recent and ongoing COVID-19 pandemic, future research should continue to explore whether space-focused stereotypes can also be found in people infected with COVID-19, which is also segregated from the public. Related research should also help reveal the relationship between human cognition and societal change.

Another aspect lies in the explicit measures of space-focused stereotypes. When measuring the space-focused stereotype and community evaluation of PLWHA, we mainly constructed the items from the view of socio-economic status based on previous literature (Bonam et al., 2016; Yantis and Bonam, 2021). However, we could not simply conclude that space-focused stereotypes of PLWHA only exist in terms of economic-related community evaluations. There are other aspects to consider when evaluating PLWHA's living spaces or communities. For example, whether PLWHA's living spaces were also stereotyped as drug- or hospital-related (illustrated in **Supplementary Table 1** in **Supplementary Materials**). Further research could extend the content of space-focused stereotypes and change the measurements according to the characteristics of the target social group.

Finally, for the manipulation of house information in Study 2, the HIV status could not be accessed when renting a house except the house owner decided to tell them. Thus, this manipulation lacked ecological validation. The present research is limited to negative evaluation and avoidance behavior for PLWHA related space. Future studies could apply a more ecologically valid approach in examining the influence of space-focused stereotypes of PLWHA. For example, as PLWHA are more likely to tell their intimate others about their HIV status, researchers could investigate the reactions of participants with differing levels of intimacy in relationship with PLWHA. The influence scope of PLWHA's living spaces could also be an interesting research topic. Researchers could investigate the point at which participants would avoid living in a community altogether based on the number of PLWHA residents. Similarly, for a community with a certain number or percentage of PLWHA, investigators could examine the distance participants would consider acceptable to be able to live without worrying about infecting HIV?

CONCLUSION

Two studies were conducted to investigate the existence and behavioral inclinations associated with space-focused stereotypes of PLWHA. The results demonstrated that space-focused stereotypes of PLWHA were explicitly significant, while the implicit GNAT test was not significant. Compared to those without HIV/AIDS, evaluation and behavioral inclinations toward the houses and living areas of PLWHA were more negative and manifested in community evaluation and community-approaching willingness. This research also revealed the emotional and cognitive pathways between space-focused stereotypes and behavioral inclinations, while threat perception and community evaluation mediated the effect of space-focused stereotypes on community-approaching willingness. Those who possessed a higher level of space-focused stereotypes of PLWHA were more inclined to avoid the houses and spaces of PLWHA. The findings from the present research suggest the existence of space-focused stereotypes with another geographically segregated social group, suggesting that cues related to space could also be a factor that forms stereotypes.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of the Center for Studies of Social Psychology. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

BZ and FW conceived and designed the whole experiment. YW and JY collected and analyzed the data. All authors contributed to the writing of this manuscript.

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SUPPLEMENTARY MATERIAL

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Who Denigrates Today's Youth?: The Role of Age, Implicit Theories, and Sharing the Same Negative Trait

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Adults perceive the youth of the present as being worse than from when they were young. This phenomenon has been shown to be a product of a memory bias, adults are unable to accurately recall what children were like in the past so they impose their current selves onto their memories. In two studies using American adults (N = 2,764), we seek to connect this finding to age, implicit theories of change, and extend the beliefs in the decline of the youth to new domains. Here we show as people age, they hold harsher beliefs about present children. Those who believe a trait does not change throughout the lifespan exhibit more forgiving attitudes toward the youth of today, believing they may not be in such decline *on that trait*. Finally, people who are low in a negative trait believe strongly that children are becoming more deficient in that particular trait (e.g., those who are not narcissistic believe the youth are becoming more narcissistic).

Keywords: social cognition, prejudice, stereotyping, implicit theories of change, implicit theories of personality, children, adult personality development, implicit change

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INTRODUCTION

"Kids, they are disobedient, disrespectful oafs; noisy, crazy, sloppy, lazy loafers. . .why can't they be like we were, perfect in every way? What's the matter with kids today?" (Bye Bye Sidney, 1963).

People widely believe that children of the present are in decline along a number of dimensions. Previous work has shown a driving force of this belief is a memory bias for the past; one where we impose our current selves onto our memories for what past children were like (Protzko and Schooler, 2019). But people themselves are not stable. We grow, decline, and change in some ways—while in other ways we can be surprisingly stable. Here, we investigate the relationship between believing children are in decline and beliefs about how those supposedly declining traits change. If people believe a trait changes over the lifespan (vs. believing it is stable), they may hold different beliefs about intergenerational change. We further investigate how both beliefs about children and traits vary as a function of age, to see how such prejudice may change over the lifespan.

Kids These Days!

People who are more intelligent think children are becoming less intelligent, people who respect authority believe children are becoming less respectful of authority, people who are well-read think children enjoy reading less (Protzko and Schooler, 2019). This phenomenon, called the kids these days effect (KTD effect), is the tendency to believe children of the present are failing on those traits one happens to be high on due to a biased memory mechanism. For each trait that was previously investigated, however, being high in the trait is a good thing (being intelligent, respectful, and well-read).

One of the mechanisms through which the KTD effect operates is imposing one's current standing on a trait backward in time to children of the past. Meaning, one who is well-read believes children "in their day" were well-read and therefore present children cannot compare to this elevated past; those who are not well-read do not hold such views (Protzko and Schooler, 2019). This process should therefore also occur when the trait in question is negative; someone who is currently *low* in a negative trait, such as entitlement, would believe children of the past were not entitled and "see" children today as *more* entitled than past children. In this study, we investigate whether the KTD effect also applies to negative traits.

Implicit Theories of Stability and Change

We are not the same as we were as children, nor will we be the same as elders. Sometimes, this is for the better, other times, for the worse. Our intuitions about how we have and will change is filled with errors [e.g., Quoidbach et al. (2013)], yet we have these implicit theories about stability and change nonetheless (Ross, 1989). Implicit theories of trait changes over time entail more than the simple fixed/growth dichotomy [e.g., Dweck (2008)], as traits can evolve in a variety of ways, including a parabolic increase into adulthood and then a decrease into old age, or increasing from childhood but then plateauing, or a U-shaped decrease from childhood into adulthood followed by an increase in old age. Do people hold the same implicit beliefs about how a trait changes over time, and are these beliefs of change related to what extent they denigrate the youth?

If people believe that a trait is fixed (i.e., that they are the same as they and *everyone* is the same as they have always been on a trait) then they may be more forgiving toward present children. A general belief that a trait is fixed within a lifetime may contribute to a perception of relatively little inter-generational change, and therefore that children today are no different on that trait than previous generations. Believing there is room for change and growth in a trait, however, may open room for differences across generations. A trait that is seen as unstable may be interpreted as something that simply changes in a "natural" fashion.

Here we investigate, in two studies, whether the KTD effects extend to new traits, including negative traits, and how these beliefs in the failings of the youth are associated with implicit theories of change.

STUDY 1

In study 1 we take two main approaches. The first is to investigate the KTD effect in two new traits, self-reliance and entitlement. The trait of entitlement is of particular interest because it provides the first examination of the KTD effect in regards to a negative trait. The second approach is to examine the relationship between the belief that children are in decline and people's intuitive theories of change about those traits. As an auxiliary investigation, we also explored how age was related to both implicit theories of change and the denigration of the youth. This study was pre-registered prior to data collection (see **Supplementary Appendix** for links).

Materials and Methods

Participants

Participants were 1,264 American adults (Age range 18–90 years old) drawn from a proprietary internet panel. The panel was instructed to draw the sample in a stratified way with unequal probabilities of selection, so that the people who complete each survey will resemble the nation's adult population (according to the most recently available Current Population Survey, conducted by the U.S. Census Bureau) in terms of gender, age, education, ethnicity (Hispanic vs. not), race (allowing each respondent to select more than one race), region, and income. These demographics were controlled by the panel provider and not asked by us, except for sex (our sample was 53% female). We aimed for 1,500 participants but due to 16% of our sample failing a comprehension check (see below) we ended up with fewer. Participants were first asked their age (M = 51.32, SD = 15.67 range 18–93). Then, were asked about declines in children or implicit theories of change scales in random order.

Belief in the Decline of Children

Measures

All participants first read: "We would like to know your thoughts about children. Compared to when you were a child: Do you think children today are (more trait/less trait/equally trait) as children were when you were a child?" For the traits in question, we used the following: intelligent, enjoy reading, respectful of their elders, able to stay focused, delaying gratification, able to save money, work ethic, self-sufficient, morally good, and entitled. Response options were "more/better trait; equally trait; worse/less trait." All questions were presented in random order (see link in **Supplementary Appendix** for full question wordings).

Afterward, on a separate page, for each question about 'kids these days' participants answered "more than" or "less than" to, they read the appropriate versions of the following: "How much more/less (trait) are children now compared to when you were a child?" Response options were unnumbered a lot more/less = −3/somewhat more/less = −2/a little more/less = −1. All questions were in random order.

Entitled and Self-Sufficient. We administered the entitlement and self-sufficiency subscales from the Narcissism Personality Inventory (Kubarych et al., 2004). This was to test the prediction that more self-sufficient people think "kids these days" are becoming less self-sufficient and that more entitled people think "kids these days" are becoming less entitled. All items were administered in random order with unnumbered response options in random order. As all items come from the overall Narcissistic Personality inventory, they were on the same page.

All participants first read:

> "This inventory consists of a number of pairs of statements with which you may or may not identify. Consider this example: I like having authority over people/I don't mind

following orders. Which of these two statements is closer to your own feelings about yourself? If you identify more with "liking to have authority over people" than with "not minding following orders," then you would choose that option. You may identify with both options. In this case you should choose the statement which seems closer to yourself. Or, if you do not identify with either statement, select the one which is least objectionable or remote. In other words, read each pair of statements and then choose the one that is closer to your own feelings. Indicate your answer by selecting the item. Please do not skip any items."

See **Table 1** for items.

Implicit Theories of Change

For the implicit theories of change questions, participants first saw a page with nine images presented horizontally all with a width of 125 pixels (see **Figure 1**).

To ensure participants understood the different natures of the change processes, we explained to them:

"On the next pages we will ask you about what you think happens to a number of different traits as we age and grow older. Below you will see nine different graphs. Each graph represents one pattern of what happens to a trait as we age. As an example, let's use how religious someone is. The first graph would mean you think people get more and more religious as they age. The second graph would mean you think people get less and less religious as they age. The third graph would mean you think people do not change in how religious they are as they age. The fourth graph would mean you think people start off religious as young children, get less religious through adulthood, but then get more religious as they grow into old age. The fifth graph would mean you think people don't change in how religious they are for most of their life, but then become less religious in old age. The sixth graph would mean you think people are not religious as children, they become more religious as they grow into adulthood, and then become less religious as they enter old age. The seventh graph would mean you think children are not religious, they become more religious as they age, then it does not change in adulthood through old age. The eighth graph would mean you think people start off religious as children, but eventually become less religious and never become more religious again. The ninth graph would mean you think people are not religious for most of their lives, but then become religious as they enter older ages. What do you think happens to how religious people are throughout their lives? Please select the option that most closely matches what you think happens."

Then, on the next page, participants saw the same nine images, this time presented vertically and in random order, and read: "Thank you, on the next pages you will be asked about your beliefs in change over the life on a number of different topics. To make sure you fully understand how to answer, please select below the option that shows no change whatsoever across the life." Any participant who failed this simple comprehension check was excluded from the analyses (consistent with our pre-registration).

Then, in random order, one page at a time, participants were asked about their belief in change on a number of traits. The order of pictures for each trait was presented vertically in random order. Participants were asked: "Starting from childhood and extending into old age, what do you believe happens to (trait) as we age? What picture best represents how we increase, decrease, and stay stable over the lifespan?" The traits we asked about were: intelligence, respect for authority, enjoying reading, ability to focus on one thing, ability to delay gratification, morality, ability to save money, work ethic, being self-sufficient, and entitlement.

Modeling Strategy

Our pre-registered analysis strategy involved first focusing just on the association of implicit theories of change with beliefs in the decline of the youth, before moving onto an analysis including age (page with links in the **Supplementary Appendix**). The original plan was then to add in age into the analysis as a covariate. These analyses are simultaneously largely consistent with the results we report below, but also not an accurate

TABLE 1 | Items used for measuring entitlement and self-sufficiency.

Entitled sub-scale	
I like to take responsibility for making decisions.	If I feel competent I am willing to take responsibility for making decisions.
I always know what I am doing.	Sometimes I am not sure of what I am doing.
I rarely depend on anyone else to get things done.	I sometimes depend on people to get things done.
I can live my life in any way I want to.	People can't always live their lives in terms of what they want.
I am going to be a great person.	I hope I am going to be successful.
I am more capable than other people	There is a lot that I can learn from other people.
Self-sufficiency	
I have a natural talent for influencing people.	I am not good at influencing people.
If I ruled the world it would be a better place.	The thought of ruling the world frightens the hell out of me.
I see myself as a good leader.	I am not sure if I would make a good leader.
I like to have authority over other people.	I don't mind following orders.
I find it easy to manipulate people.	I don't like it when I find myself manipulating people.
I will never be satisfied until I get all that I deserve.	I take my satisfactions as they come.
I have a strong will to power.	Power for its own sake doesn't interest me.
People always seem to recognize my authority.	Being an authority doesn't mean that much to me.
I would prefer to be a leader.	It makes little difference to me whether I am a leader or not.
I am a born leader.	Leadership is a quality that takes a long time to develop.

Participants score 1 point for each option in the right-hand column. Items presented in random order with response options in random order.

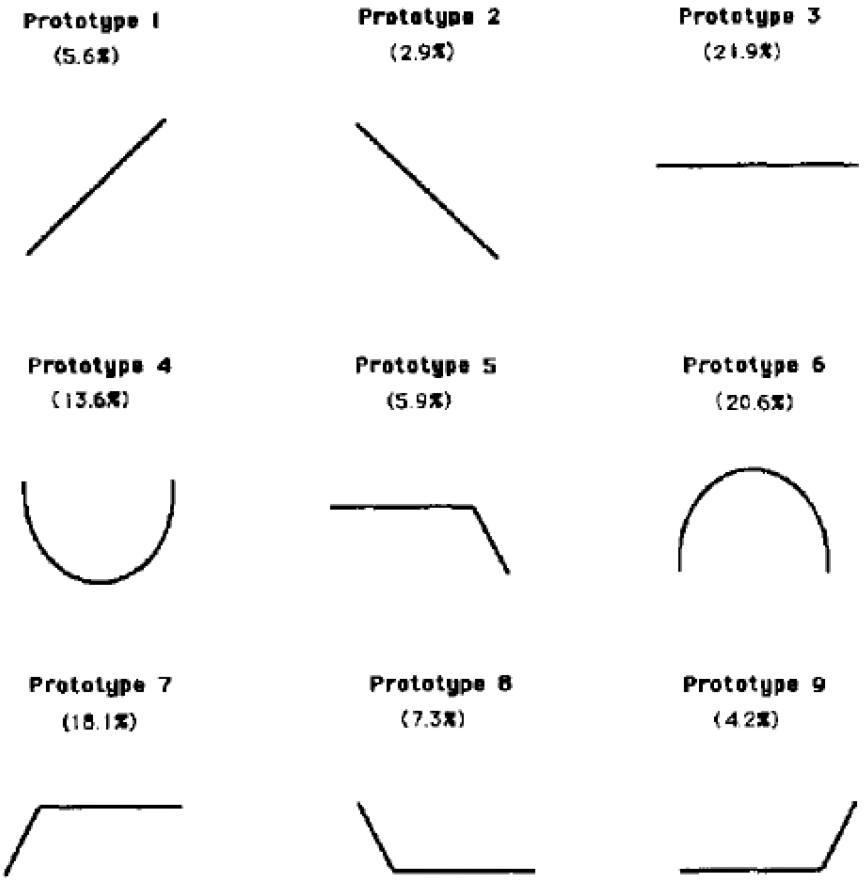

FIGURE 1 | Images representing different implicit theories of developmental change. Image taken from Figure 1 of Ross (1989). Participants saw each line with a description. Patterns referred to here as (in numerical order): increasing, decreasing, flat, U, elderly decline, parabolic, plateau, floor, elderly spike.

representation of the phenomenon under study. This is because the implicit theories of traits change people hold are not the same for older and younger participants. Older people do not have the same implicit theory of change for the same trait as younger people. Therefore, a simple linear regression would not capture the relationship of age on implicit theories, and a moderation would inappropriately omit the relationship between shifting implicit theories over age. We therefore believe the optimal model is similar to that of an indirect effects design, with age predicting both belief in the degradation of children (the *c*' path) and implicit theories of change (the *a* path). Therefore, in one model, we can look at how implicit theories of change develop over the lifespan across traits and how they simultaneously relate to belief that children are in decline. Our focus is then on what could be considered the *b* paths from an indirect effects design—the relationship of implicit theories on belief in the decline of children, after conditioning both variables on age.

In this modeling strategy, we first show what would be considered the direct effect of age on beliefs of the decline of children (the *c* path). Then, we describe how implicit theories of change develop over the lifespan for the different traits. Finally, we report the full structural equation modeling results that place into context how implicit theories of change relate to the belief in the decline of children.

Results

Beliefs of the Decline of the Youth With Age

The older someone is, the more they believe youth of the day are becoming deficient in all of the traits (see **Supplementary Appendix** for link to all results). Compared to younger participants, older people believe the youth of today are becoming less intelligent ($b = -0.005$, $p = 0.096$, 95%CI = −0.01–0.01), less respectful of authority ($b = 0.015$, $p < 0.001$, 95%CI = 0.02–0.01), enjoy reading less ($b = 0.015$, $p < 0.001$, 95%CI = 0.02–0.01), are less able to focus on one thing ($b = 0.007$, $p = 0.013$, 95%CI = 0.013–0.002), are less able to delay gratification ($b = 0.018$, $p < 0.001$, 95%CI = 0.023–0.013), are less moral ($b = 0.009$, $p = 0.002$, 95%CI = 0.014–0.003), are less able to save money ($b = 0.017$, $p < 0.001$, 95%CI = 0.022–0.012), have less work ethic ($b = 0.019$, $p < 0.001$, 95%CI = 0.024–0.013), are less self-sufficient ($b = 0.011$, $p = 0.001$, 95%CI = 0.017–0.004), are *more* entitled ($b = 0.014$, $p = 0.001$, 95%CI = 0.022–0.006). Thus, older people think the youth today are declining in every way we investigated.

"Kids These Days" Self-Sufficiency and Entitlement

We next investigated whether the kids these days effect could be shown with the positive trait of self-sufficient and the negative trait of entitlement. In the pre-registered model, there was not a statistically significant relationship between scores on the self-sufficiency subtest and believing children today are less reliant than children of the past were ($\beta = -0.035$, $p = 0.178$, 95%CI = −0.086–0.016); this model was particularly poorly fitting as well (CFI = 0.699, RMSEA = 0.059). We dropped the self-sufficiency term and just tested entitlement in isolation, which returned an exceptionally well-fitting model (CFI = 1, RMSEA = 0). With this improved model, the more entitled someone is, the more they believe that the youth today are becoming less entitled ($\beta = -0.056$, $p = 0.029$, 95%CI = −0.106 to -0.006). The corollary is the less entitled someone is, the more they believe children are entitled. This pattern of results is therefore consistent with what has been observed for "positive" traits. The higher you are on that trait, the less you think children today have it compared to children when you were a child.

Relationship Between Implicit Change Theories and the Kids These Days Beliefs

How do people's beliefs in implicit change relate to their beliefs that children today are in decline? First, participants did not hold the same theories of implicit change for all traits (see **Supplementary Appendix**). Some people tended to think certain traits are parabolic over the lifespan (like self-sufficiency or the ability to focus on just one thing) while other traits develop through childhood but then plateau in adulthood (like work ethic). For yet other traits, people tended to think they are unchanging throughout the lifespan (like enjoyment of reading).

Complicating this, these implicit theories themselves varied as a function of the age of the respondent. Older participants had different intuitive beliefs about traits than younger participants. Therefore, to analyze the relationship between implicit theories and beliefs that children today are in decline across traits, while taking into account the fact that older individuals tend to view present children more negatively and their beliefs of implicit theories of change develop, we construct an indirect effects design. Here age is associated with both the pattern of implicit change (what would be the *a* path in an indirect effects design) and the belief that children are in decline (what would be a *c*' path). Instead of looking at an indirect effect, however, we are looking at the residual relationship of implicit theories of change on the belief in the decline of children (what would be the *b* path in an indirect effects design). We arbitrarily chose "no change" as the reference variable, and provided dummy codes for all of the other theories of change. Therefore, the intercept corresponds to the belief that children today are in decline on that trait, conditioning on age, holding the implicit theory that the trait does not change. The coefficients then correspond to the relationship of having different implicit change beliefs, which themselves are different for different ages, on the belief in the decline of the youth.

We present the results by lay belief of change, indicating its relationship with each of the traits. This helps illustrate issues such as which beliefs were associated with the KTD effect across traits. Put another way, the beliefs are conceptually distinct with respect to KTD, the traits we assume going into it should all behave similarly. In most cases, believing that a trait is fixed throughout the lifespan is associated with the least amount of belief that children are in decline on that trait. For full analyses and results, and all other statistical output, see link in **Supplementary Appendix**.

Trait Increasing Throughout the Lifespan

Believing the ability to delay gratification increases throughout the lifespan is associated with believing that the youth today cannot delay gratification ($b = 0.492$, $p = 0.001$, 95%CI = 0.789–0.201), compared to believing the ability to delay gratification is stable. Those who believe morality increases throughout the life believe the youth today are becoming less moral ($b = 0.366$, $p = 0.007$, 95%CI = 0.63–0.1). Likewise, believing work ethic increases throughout the lifespan was related to having even stronger views that children today's work ethic is in decline ($b = 0.306$, $p = 0.032$, 95%CI = 0.589–0.024). Finally, believing self-sufficiency increases throughout the lifespan was associated with stronger beliefs that children today are not as self-reliant as children used to be ($b = 0.508$, $p = 0.04$, 95%CI = 1.003–0.02).

Trait Decreasing Throughout the Lifespan

Believing the ability to delay gratification decreases throughout the lifespan is associated with believing that the youth today cannot delay gratification ($b = 0.536$, $p = 0.01$, 95%CI = 0.935–0.114), compared to believing the ability to delay gratification is stable. Likewise, believing morality decreases throughout the life is associated with stronger beliefs that the youth today are becoming less moral than they used to be ($b = 0.577$, $p = 0.005$, 95%CI = 0.978–0.175).

Trait Showing a U-Shape Throughout the Lifespan

Believing morality shows a U-shaped pattern over the life is related to stronger beliefs that the youth are becoming less moral ($b = 0.395$, $p = 0.01$, 95%CI = 0.692–0.091).

Trait Stable Until a Decline in Old Age

Believing morality is stable throughout life but declines in the elderly is associated with stronger beliefs that the youth are becoming less moral ($b = 0.532$, $p = 0.008$, 95%CI = 0.928–0.136).

Trait Showing a Parabolic Shape Throughout the Lifespan

Those who believe the ability to focus is parabolic hold even stronger views that children today cannot focus as well as children of the past ($b = 0.384$, $p = 0.015$, 95%CI = 0.693–0.074). Similarly, believing morality is parabolic is associated with holding stronger beliefs that the youth are becoming less moral ($b = 0.371$, $p = 0.044$, 95%CI = 0.721–0.009).

Trait Increasing Into Adulthood, Then Plateaus

Believing the ability to delay gratification grows until a plateau in adulthood is associated with stronger beliefs that the youth today cannot delay gratification ($b = 0.432$, $p = 0.005$, 95%CI = 0.739–0.133), compared to believing the ability to delay gratification is stable. Similarly, holding the belief that the ability to save money develops through childhood but then plateaus in adulthood

throughout life is related to holding stronger beliefs that children today cannot save money like they used to be able to ($b = 0.341$, $p = 0.043$, 95%CI = 0.671–0.006).

Trait Decreasing Into Adulthood, Then Stable

Believing morality declines to an adulthood floor, then is stable is associated with believing the youth today are becoming less moral than they used to be ($b = 0.638$, $p = 0.001$, 95%CI = 0.998–0.264).

Trait Stable Until Old Age, Then Increases

People who believe that intelligence spikes upward in the elderly were more likely to believe that children today are becoming less intelligent ($b = 0.455$, $p = 0.028$, 95%CI = 0.848–0.036). Believing the ability to delay gratification spikes upward in adulthood is also associated with stronger beliefs that the youth today cannot delay gratification ($b = 0.342$, $p = 0.032$, 95%CI = 0.656–0.035). This pattern is also seen for morality ($b = 0.401$ $p = 0.013$, 95%CI = 0.702–0.078) and the ability to save money; those who believe the ability to save money increases in late adulthood are more likely to believe the youth today cannot save money like they used to ($b = 0.513$, $p = 0.002$, 95%CI = 0.84–0.188).

Discussion

Study 1 showed five important things. First, the KTD effect was replicated in a new domain, entitlement, which is important both because it further establishes the breadth of the phenomenon and it generalizes it to a trait that many would consider negative. A major focus of Study 2 is to expand the investigation of the KTD effect into more negative traits, to see if we can replicate this finding that those *low* in a negative trait are *more* likely to see youth of the day getting worse in it. Second, Study 1 demonstrated that overall people think kids these days are in decline across a host of different traits not investigated before. Third it showed that this perception of decline was particularly pronounced with the elderly. Fourth it showed that theories of decline interacted with lay theories of change. Finally, it demonstrated that the nature of people's theories varied both across individual and across traits. One focus of study 2 is to manipulate implicit theories of change to test the causal role of such beliefs on denigrating children.

STUDY 2

Study 2 expands the investigation of why people believe children are in decline to additional traits that are considered negative. Previous work has shown people believe children of the present (regardless of which present it is) possess less admirable qualities than children of their past (Protzko and Schooler, 2019). Could it be the case that children are simply less of everything, including negative traits (e.g., children of the present are seen as less manipulative), or is it that people believe children of "the present" have less of good qualities but also more negative qualities?

Procedures and Methods

Participants were 1,500 participants, drawn in a stratified way using the same sampling requirements in study 1. This sample size was chosen to maximize sample size under a fixed availability of funds to spend on this project.

Participants first filled out their age. They were then randomly assigned to either fill out the trait measures first or the kids these days scales first.

Trait Measures

All trait measures were administered in random order with each scale on a separate page. We chose a trait (self-control) that can be portrayed either positively (restraint) or negatively (impulsive). We also chose negative traits based on the literature of the Dark Triad [psychopathy, Machiavellianism, narcissism; Paulhus and Williams (2002)] and replicated our results from study 1 on entitlement. For each trait measure, we attempted to identify the most psychometrically sound scale possible.

Impulsivity and Restraint (Self-Control)

Self-control is the ability to shape one's behavior through thoughtful behavior control [e.g., Carver (2005)]. Objective measures of self-control have shown poor measurement properties when administered online, most self-report measures also showing less than ideal measurement properties (Enkavi et al., 2019). One measure, however, has shown adequate measurement properties when administered online, the Brief-Self-control Scale [Maloney et al. (2012); see also Enkavi et al. (2019)]. This scale is composed of two subscales, one about how impulsive one is, and the other about how restrained one is. For our investigation we used both subscales (see **Supplementary Appendix** for full question wording and scoring). Reliability in our sample was good for the two-factor correlated factor model [$P_{CF} = 0.85$; Cho (2016, 2022)].

Psychopathy

Psychopathy is a trait conceptualized as impulsive behavior undertaken to gratify one's desires with a complete lack of care for the impact on others [e.g., Hare et al. (1991)]. People who are high in psychopathy do not care about the consequences of their actions on other people. We chose the psychopathy scale from the dirty dozen scale (Webster and Jonason, 2013) as our measure of psychopathy (see **Supplementary Appendix** for full Wording and scoring). Reliability in our sample was good ($\omega_p = 0.88$).

Machiavellianism

Machiavellianism is the trait of manipulating others toward your own ends [e.g., Paulhus and Williams (2002)]. For this scale, we likewise chose the Machiavellianism subscale from the dirty dozen measure (Webster and Jonason, 2013; see **Supplementary Appendix** for full question wording and scoring). Reliability in our sample was good ($\omega_p = 0.9$).

Narcissism

While a narcissism measure also exists as part of the dirty dozen, investigations into the psychometric properties of that scale have cast doubt on the validity of the narcissism items [see Kajonius et al. (2016)]. To measure narcissism, we therefore administered the short Narcissistic Personality Inventory (Ames et al., 2006; see **Supplementary Appendix** for full question wording and scoring). The reliability of this scale in our study was good ($\hat{\omega} = 0.72$, Padilla and Divers, 2016).

Entitlement

Entitlement was measured the same way as it was in study 1. The reliability of this scale in our study was adequate ($\hat{\omega} = 0.68$, Padilla and Divers, 2016).

Kids These Days Questions

Kids these days questions were measured using the same format as in study 1. All participants were first told "We would like to know your thoughts about children." For self-control, we asked participants whether they think children today were better, worse, or equally able to control themselves as children could when they were a child. For psychopathy, we asked participants whether they think children today are more, less, or equally concerned about the morality of their actions as children were when they were a child. For Machiavellianism, we asked participants whether they think children today are less, more, or equally manipulative as children were when they were a child. For narcissism, we asked participants whether they think children today are less, more, or equally narcissistic as children were when they were a child. For entitlement, we asked whether participants think children today are more, less, or equally as entitled as children were when they were a child. All questions were presented on the same page in random order. Participants who chose "more than" or "less than" were asked on the next page to what extent they thought children were more or less on that trait. All scales were coded on -3 to 3 scales with 0 as "equal to" and higher scores indicating a stronger belief that children are declining.

We further attempted to manipulate implicit theories of change, to test the causal effects of such beliefs. This manipulation, however, proved unsuccessful, but additional details are available at the link in the (**Supplementary Appendix**). This study was pre-registered prior to data collection.

Results

Self-Control

On average, people believed children today are worse at exerting self-control than children were when they were a child ($b_0 = 2.256$, $p < 0.001$, 2.622–1.889). When it came to the two measures of participants' self-control, our pre-registered model used both impulsivity and restraint as predictors simultaneously. Consistent with our theoretical model, the less impulsivity problems someone has, the more they believe that children today are worse at self-control ($\beta = -0.296$, $p < 0.001$). There was no relationship between how much restraint who believes they have and the belief that children today are in decline in self-control ($\beta = -0.052$, $p = 0.135$). Thus, the more impulsive (negative trait) someone is, the less they believe children today cannot control themselves. As an exploratory analysis we also found the older someone is the more they believe that children cannot control themselves ($\beta = 0.328$, $p < 0.001$).

Psychopathy

Similar to impulsivity, people believed that children today are more psychotic than children were when they were a child ($b_0 = 2.022$, $p < 0.001$, 95%CI = 2.217–1.828). Furthermore, consistent with our predictions, the less psychopathic tendencies someone has, the stronger they believe children today are becoming more psychotic ($\beta = -0.345$, $p < 0.001$). As an exploratory analysis we also found the older someone is the more they believe that children are getting more psychopathic ($\beta = 0.326$, $p < 0.001$).

Machiavellianism/Manipulativeness

On average, people believed children today are becoming more manipulative than children were when they were a child ($b_0 = 1.392$, $p < 0.001$, 95%CI = 1.573–1.211). Again consistent with our theoretical model, the less manipulative someone is, the more they believe children today are becoming more manipulative ($\beta = -0.155$, $p < 0.001$). As an exploratory analysis we also found the older someone is the more they believe that children are becoming more manipulative ($\beta = 0.214$, $p < 0.001$).

Narcissism

On average, people believed that children today are a little more narcissistic than children were when they were a child ($b_0 = 1.288$, $p < 0.001$, 1.423–1.152). Consistent with our theoretical model, the less narcissistic someone is, the more they believe children are becoming more narcissistic ($\beta = -0.131$, $p < 0.001$). As an exploratory analysis we also found the older someone is the more they believe that children are becoming more narcissistic ($\beta = 0.264$, $p < 0.001$).

Entitled

Replicating study 1, people thought children today are a little more entitled than children were when they were a child ($b_0 = 1.45$, $p < 0.001$, 95%CI = 1.59–1.31). Again consistent with our theoretical model, the less entitled someone is, the more they believe children today are becoming more entitled ($\beta = -0.11$, $p < 0.001$). As an exploratory analysis we also found the older someone is the more they believe that children are becoming more entitled ($\beta = 0.33$, $p < 0.001$).

Across the five negative traits (**Figure 2**), including impulsivity, psychopathic tendencies, Machiavellianism/manipulativeness, narcissism, and entitlement, we found consistent evidence that people who score lower on a negative trait are more likely to believe that children today are deficient in those specific traits. These results remained the same when controlling for participants age (see **Supplementary Appendix** for link to results).

Thus, it is not the case that people who are high in a trait necessarily see the youth as possessing less of that trait, nor is it the case that people think the youth of today are simply lacking in all traits. People tend to believe children of the day have less of good traits on those dimensions on which they excel and more of negative traits that they avoid. Finally, as is clear in **Figure 2**, even the most narcissistic, the most entitled, or the most manipulative people, while holding less prejudice against the youth of the present on those traits, still don't think kids these days are getting better. At most, individuals at each of the highs end of these trait distributions tend to think that today's youth are similar on their respective trait to kids when they were young.

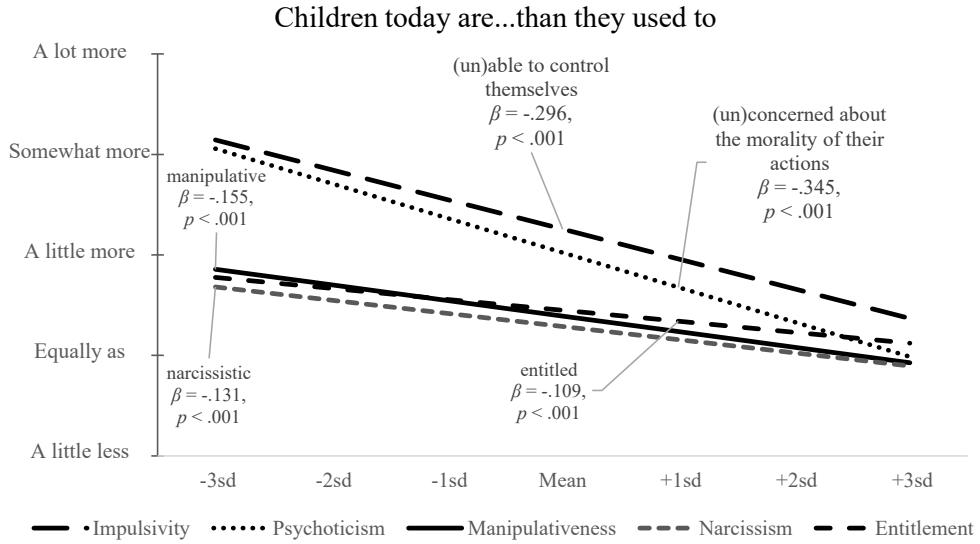

FIGURE 2 | One's standing on a trait and the belief that children today are particularly deficient in that one trait. The lower one is on a negative trait, the more likely they believe children today to be afflicted by that trait.

GENERAL DISCUSSION

Across two studies, we expanded our understanding and bounds of the persistent belief that children today are in decline. This has been referred to as the "Kids These Days" Effect (KTD) and has been shown to arise (at least in part) from a biased memory (Protzko and Schooler, 2019). People high in a trait impose their standing on the trait backward in time and apply it to children of the past. Present children naturally appear in decline compared to this artificially inflated past. Previous work demonstrated this memory mechanism through manipulating people's beliefs in their current standing on a trait—making people feel like they were lower on a trait attenuated the KTD effect (Protzko and Schooler, 2019).

In prior research, the KTD effect was demonstrated with exclusively positive traits [e.g., intelligence, respect for authority, enjoyment of reading; Protzko and Schooler (2019)]. Here we expand this finding to negative traits, ones that are normatively considered undesirable to have, and explore another possible mechanism. First, we show people who are especially low on a negative trait are those most likely to believe that children are in decline (i.e., increasingly exhibiting) that particular trait. This relationship is consistent with the biased memory mechanism. Our second expansion was to explore an additional reason for the KTD effect. Specifically, we sought to map the belief that children are in decline onto people's beliefs regarding how different traits grow and change over the lifespan. Our third expansion was to map how this prejudice is different for older vs. younger participants.

Belief Children Are in Decline Over Age

In every trait we measured, the older someone was the more they believed children were deficient in that specific trait. This was equally true for thinking children had less of positive traits as well as more of negative traits. Older participants were overall more critical than younger ones.

A number of possibilities could explain older people's particular penchant for denigrating today's youth. If children have been continuously deteriorating over generations, then relative to younger adults, older adults would be using an objectively better reference class to compare children of the present. This seems unlikely as the same complaints have been lodged against children for millennia (e.g., Freeman, 1907). Additionally, previous work has shown the KTD effect to be at least partially independent of individuals actual experience with children in their youth, as experimentally manipulating people's self-assessments of themselves impacts the magnitude of the KTD effect (Protzko and Schooler, 2019). Furthermore, investigations into the objective truth about some traits over generations have shown present children are actually higher on traits such as intelligence (Flynn, 1984) and the ability to delay gratification (Protzko, 2020) compared to children of the past. Therefore, the enhanced denigration of youth for older individuals is unlikely to be rooted in their accurately recalling an objectively better prior generation.

Another possible explanation for this age effect is that as people age they remember their own childhoods more favorably (Fernandes et al., 2008; cf. Field, 1997). This could lead older participants to artificially elevate their past, thinking everything was better. Accordingly, older adults' belief that children today are particularly deficient may not reflect a reduced assessment of today's youth so much as an inflated assessment of children from their generation. Future research should be directed at determining the exact nature of this finding.

Another factor could be that older adults may have less recent experience with contemporary youth, so they may rely more on their memory of kids from the past, and less on their experience with kids of the present.

Finally, changes in our traits as we age can also drive this age effect. As people age they become less narcissistic (Chopik and Grimm, 2019), for example. The less narcissistic someone is, the more they think children are becoming more narcissistic (study 2). Thus, as people age they may believe children are becoming more narcissistic precisely because *they* are becoming less so. Future work in the patterns of prejudice over aging could elucidate these potential mechanisms.

Connecting Implicit Theories of Change to Denigrating Children

Across most of the traits under question, people who believed the trait does not change over the lifespan, that it is fixed, held the most moderate views toward children's supposed decline. Across all traits but one (entitlement), those who believed the trait under question changes in any way were statistically more likely to believe children are in decline. In the case of intelligence, ability to delay gratification, ability to save money, and self-sufficiency, holding this fixed mindset was related to not only having the most moderate views toward children's decline but also believing they were actually not in decline at all. For traits where everyone, regardless of implicit theory of change, believed children are in decline (enjoying reading, respect for authority, ability to focus, morality), holding a fixed mindset was related to having the weakest views about the decline of the youth.

The belief that stable traits show the least intergenerational decline may arise because people assume that if a trait does not change within a lifetime, then it is unlikely to change across lifetimes. Accordingly, children of the "present" are likely no different from children of the past on such an unchanging trait. This suggests that the KTD effect could be reduced by increasing people's belief in the fixedness of traits. Unfortunately, we were not able to test this conjecture, as although we tried to manipulate this belief in Study 2, we were unsuccessful in doing so.

Negative Traits and the Decline of the Youth

Our previously established mechanism for the belief that children are in decline was that it primarily operated through a memory bias (Protzko and Schooler, 2019). This occurs because people who were high in a positive trait (like intelligence or being well-read) impose that backward in time onto children of their youth, artificially exaggerating their possession of that trait. In reality, our memories for what all children were like decades ago is not accurate. This memory bias makes the interesting prediction that those who are high in a negative trait (e.g., narcissism) impose that backward in time to all children (e.g., all children of the past were narcissistic) and then compared to an artificially exaggerated memory, children today appear *less* narcissistic. This is exactly what we found with the negative traits. In study 2, every negative trait showed this same pattern, namely, those high in a negative trait held weaker beliefs about the decline of the youth than those who were low on the negative trait.

It is notable that, on average, people did not believe the youth of the day were getting better on any trait than previous generations. This is especially noteworthy because some traits we investigated, like the ability to delay gratification, have been increasing over generations (Protzko, 2020). The memory model that helps explain these prejudices and why they are stronger among some people assumes that people have some sense of their quality on a given dimension. Possessing some knowledge of their particular traits enables individuals to project those qualities back on to all children of their generation. A corollary of this account is that any biases in self-appraisal should similarly be projected back. Indeed people's positive bias regarding their own self-assessments [e.g., Zell et al. (2020)] may help to explain why people who excel in positive traits perceive kids these days as in decline on those traits, whereas people who excel on negative traits at best think kids today are comparable to kids of the past. Accordingly, when people excel on a positive trait their inflated assessment is passed on to their appraisal of children in the past, thereby causing them to think today's children are lacking. When people are lacking in a positive trait or excel on a negative trait, their upward assessment of themselves is similarly passed on to the children of their generation, causing them to be perceived as at least average on that trait and thus no different from average children today.

Limitations

One limitation of these studies is we did not assess whether participants were parents themselves. It could be the case that parents have a different view of the "kids these days" phenomenon themselves. Having more experience with today's youth, parents might have a more accurate assessment and thus exhibit a reduced KTD effect. Alternatively, parents might be more inclined to think back to when they were kids, thereby inflating the memorial mechanism that has been found to drive the KTD effect. Future work should include these important moderators for investigation.

CONCLUSION

For millennia, people have believed the youth of the day are in decline compared to previous generations. While this work cannot speak to the veracity of claims that children are more or less narcissistic or entitled or manipulative, we can now better understand why it may appear so strongly to some people and not to others. First, older people are more likely to see this supposed decline. Second, belief in whether a trait changes over the lifespan is associated with such prejudices. Holding a fixed mindset about a trait is associated with showing the least amount of intergenerational prejudice toward the youth. Finally, this supposed decline occurs similarly for both positive and negative, with present youth being attributed both less of positive traits and more of negative traits. The higher one is on a positive trait, the less of that trait one sees the youth having. Conversely, the lower one is on a negative trait, the more one sees the youth of today as afflicted by that trait. Prejudice against the youth of the day entails them both not having the good traits we have, and possessing the bad traits we do not. It seems the age-old tendency to denigrate the youth of the present will continue until we recognize that their

apparent decline is not a failing of them, but of our memories of what kids were like in the past.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/ **Supplementary Material**.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by ORAHS, University of California, Santa Barbara. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JP collected the data, ran the analyses, and wrote the manuscript. Both authors developed the concept, designed the study, edited the final version, and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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More Power, More Warmth: The Enhancing Effect of Power on the Perceived Warmth About High-Power Individuals Under Chinese Culture

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Previous literature concerning power stereotypes demonstrates that compared to low-power (LP) individuals, high-power (HP) individuals tend to be perceived as having positive competence but negative warmth. Based on previous research, the current research further classified HP into senior and junior HP and mainly compared the perceived warmth between senior and junior HP individuals in Chinese culture. By classifying power into HP and LP, the pilot study employed the trait-rating task to replicate the results of previous research. In Study 1, we classified HP into senior and junior HP and revealed that participants indicated more positive warmth evaluations for senior HP individuals than for junior HP individuals. We named this "more power, more warmth" effect the MPMW effect. Further investigation demonstrated that the MPMW effect was more likely to emerge for participants with high Confucianism identification (Study 2a), for Chinese participants rather than Western participants (Study 2b), or when the knowledge of Confucianism was accessible in a given situation (Study 3). The present research firstly demonstrated that the contents of power stereotypes may partially display culture-specific characteristics in Chinese culture. The continuous classification approach to power provided a novel insight for future power research.

Keywords: power, stereotypes, Confucianism, stereotype content model, social cognition, impression formation

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INTRODUCTION

In China, there is a well-known proverb "It's easy to deal with Yama, but hard to do with devilkins". Under Chinese culture, the "devilkins" generally refer to those junior HP individuals who are primarily responsible for directly managing ordinary people in a society or employees in a company, such as community directors, workshop managers, etc. The "Yama" often refers to those senior HP individuals who are primarily responsible for managing junior HP individuals rather than ordinary people in a society or employees in a company, such as ministers, Board Chairman, etc. From the perspective of social psychology, the proverb reflects the consensus of Chinese people about power stereotypes. That is, if HP individuals are divided into senior HP individuals (e.g., Board Chairman) and junior HP individuals (e.g., Workshop Manager), compared to junior HP individuals, senior HP individuals will be considered to display more positive warmth traits in communication with others.

It should be pointed out, to our knowledge, that previous power literature commonly investigates the effect of power by simply classifying power into HP and LP (Anicich et al., 2020),

so we are not sure whether the proverb mentioned in the beginning can receive the supports from empirical research. In other words, although previous power stereotype research in Chinese culture has consistently demonstrated that more power is generally associated with less perceived warmth when comparing HP with LP individuals (Zhang et al., 2015; Wang et al., 2017), it is still unclear whether the elevation of power will be associated with more/less perceived warmth about senior and junior HP individuals. To fill this gap, we conducted four studies on Chinese culture to examine whether there was the "more power, more warmth (MPMW)" effect—more power was associated with more warmth perception about the stereotypes of HP individuals, and we also attempted to specify the condition for the emergence of the MPMW effect. It should be noted that the so-called "more power, more warmth" effect in the research exclusively referred to the warmth perception comparison between senior and junior HP individuals, rather than the warmth perception comparison between HP (including senior and junior HP) and LP individuals.

LITERATURE REVIEW

Stereotype Content Model and Power Stereotypes

In order to make sense of our surrounding social world without being cognitively overwhelmed, we humans tend to process information about others based on their social categories (Fiske and Neuberg, 1990; Carlsson and Björklund, 2010). We do this by employing stereotypes, which are considered to be some socially shared beliefs that the members of a social category commonly possess some typical traits or characteristics (Hilton and Hippel, 1996). To date, researchers have revealed various stereotypes, such as race, gender, and age stereotypes (Devine, 1989; Banaji and Hardin, 1996; Chasteen et al., 2002). An interesting phenomenon pertaining to stereotypes is that the stereotypes of a specific group often contain a mix of traits that widely differ in evaluative orientation (Fiske et al., 2002; Cuddy et al., 2008). For example, stereotypes about lawyers include some typically positive traits (e.g., smart, professional) and at the same time include some typically negative traits (e.g., pitiless, profit-oriented). In order to describe this mixed content of stereotypes, Fiske et al. (2002) developed the Stereotype Content Model (SCM). According to the SCM, warmth, and competence are universal and fundamental dimensions in social judgments and warmth is the primary dimension (Fiske et al., 2007; Cuddy et al., 2008). The warmth dimension mainly answers the question regarding whether the other person is friendly or hostile in social interaction, and the competence dimension represents the person's capability to carry out the intention (Fiske et al., 2007). The four combinations of high vs. low warmth and competence elicit four unique patterns of behavioral and emotional responses (for a detailed review, see Cuddy et al., 2008). The SCM further postulates that people often hold ambivalent stereotypes toward out-group members—they tend to be evaluated as positive on one dimension and negative on the other dimension. For instance, old people are stereotyped as warm but incompetent and lawyers are perceived as highly competent but cold (Carlsson and Björklund, 2010). Supporting the proposition of ambivalent stereotypes, past research in the power field suggests that HP individuals tend to be stereotyped as having positive competence but negative warmth. That is, they commonly receive positive evaluations on the competence dimension but negative evaluations on the warmth dimension. In contrast, LP individuals tend to be stereotyped as having negative competence but with positive warmth. That is, they commonly receive negative evaluations on the competence dimension but positive evaluations on the warmth dimension (Russell and Fiske, 2008; Fragale et al., 2009; Zhang et al., 2013, 2015).

Power is a fundamental part of our social life and has profound effects on our psychological and behavioral processes (Fiske and Dépret, 1996; Magee and Galinsky, 2008). Generally, power is defined as an individual's relative capacity to modify others' states by providing/withholding resources or administering punishments (Keltner et al., 2003). In essence, power means asymmetric control or dependence—LP individuals depend on HP individuals but HP individuals are independent of LP individuals (Lammers et al., 2012). Thus, HP individuals are less motivated to pay attention to LP individuals surrounding them, because they can achieve their goals without the assistance of LP individuals (Chen et al., 2009; Guinote et al., 2012). In contrast, LP individuals need to display socially desirable traits so that they can acquire necessary resources from HP individuals (Magee and Smith, 2013). As a result, in line with the propositions of the SCM, HP individuals are inclined to be perceived as positive competent but negative warmth, and LP individuals are inclined to be perceived as negative competent but positive warmth. For an instance, Zhang et al. (2015) utilized the implicit association test (IAT) to detect the contents of power stereotypes. With regard to the target dimension, they selected 16 power labels as target words: 8 HP labels and 8 LP labels. With regard to the warmth dimension, they selected 16 power-stereotype-relevant traits as attribute words: 8 HP stereotype-consistent traits (4 positive competence traits and 4 negative warmth traits) and 8 LP stereotype-consistent traits (4 negative competence traits and 4 positive warmth traits). Following the standard procedure of the classic IAT (Greenwald et al., 1998), participants needed to respond to the compatible combinations (HP–positive competence/negative warmth, LP–negative competence/positive warmth) in Parts 3 and 4, and respond to the incompatible combinations (HP–negative competence/positive warmth, LP–positive competence/negative warmth) in Part 6 and 7. The results showed that participants generally needed longer reaction times to respond to the incompatible combinations than the compatible combinations, resulting in a significantly greater D value than 0. The results of the research suggested that participants tended to perceive HP individuals as positive competent but negative warmth and perceive LP individuals as negative competent but positive warmth.

Power Construction and Confucianism

In the Han dynasty of China, the emperor Wudi established Confucianism as the only accredited philosophy in order to maintain social stability—the so-called "Ban from hundred

philosophers, venerate Confucianism". Since then, Confucianism has been the dominant philosophy in China for nearly two thousand years and produces a far-reaching influence on the Chinese people (Fung, 1948/2018). Regarding how one person should exert his power, Confucianism on the hand asserts that power-holders should have a great social responsibility and devote their lives to serving the whole society (Chen and Chung, 1994; Hwang, 2012). For example, Confucianism declares that an excellent governor should love ordinary people as if they were his own children. In line with this declaration, empirical research also suggests that HP individuals under Confucian culture are expected to have great social responsibility and concern for the wellbeing of others (Low and Ang, 2012, 2013). In this sense, HP individuals are expected to display positive warmth in communication with others. However, on the other hand, Confucianism puts an emphasis on the stateliness, status, and even privilege of HP individuals in daily communications (Chen and Chung, 1994; Chen et al., 2013). For instance, Chen et al. (2013) found that under Confucian culture, when a leader put forward a project plan, those subordinates tended to express advocacy toward the plan rather than directly raised doubts or modifications, because the latter could be regarded as a challenge toward the authority of power. As a result, in daily communications with others, HP individuals may be perceived as negative warmth due to the emphasis on the hierarchical order. Taken together, we reasoned that Confucianism may lead to being the discrepancy in the impressions between the expected HP individuals in the public mind and the encountered HP individuals in real communications—HP individuals tend to be associated with positive warmth in expectation but tend to be associated with negative warmth in real communications.

Although the above proposition to date has received less empirical support, to some extent, it is consistent with the widely accepted individualism/collectivism classification hypothesis, which defines Chinese society as a vertical collectivist society (VC; Singelis et al., 1995; Triandis, 1995; Triandis and Gelfand, 1998; Triandis et al., 1998). Specifically, Torelli and Shavitt (2011) have pointed out that individuals in the VC society have relatively complex conceptualizations of power. On one hand, HP individuals in the VC society are considered to put an emphasis on personal success and status in the hierarchy, and subordinates' compliance to the will of authority, which may prompt them to display negative warmth in communication with others. Meanwhile, HP individuals in the VC society are expected to join others in the group to compete with out-groups, and even sacrifice personal benefits for the sake of in-group goals. In this sense, they seemingly are expected to be positive on the warmth dimension. To some extent, these seemingly contradictory characteristics displayed by HP individuals in the VC society are consistent with our proposition about the discrepancy between the expected HP individuals and the perceived HP individuals in real experiences. Moreover, beyond previous research adopting the traditional individualism/collectivism perspective, our Confucian perspective provided an alternatively deeper explanation for the seemingly contradictory characteristics of HP individuals in the VC society—it may root in Confucianism.

One may question if the discrepancy exists between the expected HP individuals and the perceived HP individuals in real experiences, why previous research on Chinese culture consistently demonstrates that HP individuals are perceived to be positive competence but negative warmth (Zhang et al., 2013, 2015; Wang et al., 2017). It should be pointed out, that previous research in the power field commonly classifies power into HP and LP in a dualistic way, no research to date has divided HP into senior HP and junior HP (Anicich et al., 2020). However, for ordinary Chinese people, although junior HP individuals (e.g., local officials) and senior HP individuals (e.g., central officials) both belong to HP individuals, they actually may have different impressions about such two types of HP individuals. One important reason for our reasoning is that in daily life, most ordinary people interact with junior HP individuals rather than senior HP individuals. So, for most people, the accessibility of the knowledge of junior HP individuals should be higher than the accessibility of the knowledge of senior HP individuals. Accessibility generally refers to a state that is produced by prior processing of a stimulus and thus activates knowledge (Förster and Liberman, 2007). In this case, when mentioning HP individuals by default, most people may form the impression about them based on their experiences of interacting with junior HP individuals, and then utilized the impressions of junior HP individuals to represent the whole HP individuals. So, our first hypothesis was:

> *When power was divided into high power and low power, consistent with previous theoretical and empirical research, individuals in Chinese culture would perceive HP individuals as positive competence but negative warmth* (Hypothesis 1).

According to our thesis 1, when HP individuals have not been divided into senior and junior HP individuals, Chinese people may (unconsciously) rely on their experiences of interacting with junior HP individuals to form an impression about the whole HP individuals. As a result, HP individuals tend to be perceived as having negative warmth. However, upon explicitly making a distinction between senior and junior HP individuals, people still can form the impression about junior HP individuals based on their real experiences, whereas such experiences are less available to represent senior HP individuals. In this case, as a chronically accessible construct (for a detailed introduction to the accessibility theory, see Higgins, 2012), Confucian constructions about HP individuals thus can be easily retrieved and used in impression formation about junior HP individuals. Indeed, past stereotype literature has suggested that some task-relevant information with the ease of retrieval tends to be used in impression formation with a high priority (Gawronski and Bodenhausen, 2005; Weick and Guinote, 2008). Considering that Confucianism alleges that HP individuals should have great social responsibility and concern for others, our second hypothesis was:

> *When explicitly classifying HP individuals into senior and junior HP individuals, participants may give more positive warmth evaluations for senior HP individuals than for junior HP individuals* (the MPMW effect, Hypothesis 2).

According to our previous reasoning, due to the dominance of Confucianism in China, Chinese people may give more positive evaluations on the warmth dimension for senior HP individuals than for junior HP individuals. Following this reasoning, we can further speculate that if individuals in a specific situation have less identification with Confucianism, they should be less likely to evaluate senior HP individuals as positive warmth. In other words, individuals' identification with Confucianism may moderate the MPMW effect—in a specific situation, only when the majority of individuals keep identification with Confucianism, can our expected MPMW effect on HP individuals appear. As for the competence dimension, considering that the social responsibility emphasized by Confucianism mainly has an influence on the warmth perceptions of senior HP individuals, we expected that the competence perceptions toward senior HP individuals were insensitive to participants' Confucianism identification. So, our third hypothesis was:

> *Participants' identification with Confucianism was the premise of the MPMW effect: Only when most participants keep identification with Confucianism in a specific situation, would they give more positive warmth evaluations for senior HP individuals than for junior HP individuals* (Hypothesis 3).

In addition to the above three issues, out of curiosity, we also wanted to know whether Chinese participants would give more positive warmth evaluations for senior HP individuals than for LP individuals. However, because of lacking relevant literature, we cannot make a clear assumption about the warmth comparison between senior HP individuals and LP individuals. Moreover, this is not our major concern in the current research. Given that, we would conduct an exploratory investigation about this issue.

THE CURRENT RESEARCH

Overall, the current research aimed to explore the "more power, more warmth (MPMW)" effect of HP stereotypes in Chinese culture, and the determining role of Confucianism in the existence of the MPMW effect. To this end, we firstly conducted a pilot study in which we used the trait-rating task to preliminarily examine the contents of power stereotypes about HP and LP individuals. We anticipated that consistent with previous research (Russell and Fiske, 2008; Fragale et al., 2009; Zhang et al., 2013), HP individuals tended to be stereotyped as positive competence but negative warmth while LP individuals tended to be stereotyped as negative competence but positive warmth. Based on this, we then conducted Study 1 in which we again used the trait-rating task to examine the contents of power stereotypes about senior HP, junior HP, and LP individuals. In Study 1, we put our main focus on the comparison between senior and junior HP stereotypes, and we predicted that compared to junior HP individuals, senior HP individuals tend to be perceived as more positive on both competence and warmth dimensions. In the following Study 2a and 2b, by using the trait-rating task, we exclusively compared the stereotypes about senior and junior HP individuals and also explored the role of Confucianism in the MPMW effect. In Study 2a, we developed the Confucianism identification scale to examine whether the MPMW effect only emerged for participants displaying high identification with Confucianism. In Study 2b, we conducted an online cross-cultural study (Chinese participants vs. Western participants) to examine whether the MPMW effect appeared among Chinese participants rather than Western participants. In Study 3, we presented the counter-Confucianism stimuli to temporarily reduce the accessibility of Confucianism and then compared the magnitude of the MPMW effect in the implicit association task (IAT) between the Counter-Confucianism and the control conditions (no presenting the counter-Confucianism stimuli). We predicted that, due to the temporary decline of the Confucianism accessibility under the Counter-Confucianism condition, the MPMW effect would be significantly attenuated under this condition.

PILOT STUDY

Before examining power stereotypes in a relatively continuous way, we firstly conducted a pilot study in which we classified power into HP and LP in a dualistic way and investigated the contents of power stereotypes via the trait-rating task. By doing so, we not only could give the empirical test for our hypothesis 1 but also could establish the basis for our further investigation of HP stereotypes. In the trait-rating task, we selected "leader" and "ordinary people" as two target groups, and for each target group, participants needed to indicate to what extent the given traits (including positive and negative traits on both competence and warmth dimensions) were suitable to describe that group. To confirm the fitness between the selected traits and the two presupposed dimensions (competence and warmth), in another independent sample ($n = 46$, 18 men, 18 women, $M_{age} = 20.64$, $SD = 3.14$), we asked participants to report whether and to what extent each pair of traits belong to the competence or the warmth dimension on an 11-point scale (ranging from -5 to 5, -5 = completely belong to the competence dimension, 5 = completely belong to the warmth dimension). Then, following previous research (Leach et al., 2007), a confirm factor analysis (CFA) was performed on participants' scores with a maximum likelihood estimation. In the CFA, the two latent factors were allowed to correlate, but no errors on specific items were allowed to correlate. The results showed an acceptable mode fitness, $\chi^2/df = 1.17$, $p = 0.23$, $CFI = 0.93$, $TLI = 0.91$, $SRMR = 0.08$, $RMSEA = 0.06$ (Hu and Bentler, 1999).

According to prior literature (Russell and Fiske, 2008; Fragale et al., 2009; Yang et al., 2019), in the trait-rating task of the pilot study, we speculated that participants would rate HP individuals as positive competence but negative warmth, and LP individuals as negative competence but positive warmth. More detailed introductions about the trait-rating task would be provided in Section Materials and Procedure.

Participants and Design

A pilot study was a 2 (target power: high vs. low) × 2 (stereotype dimension: competence vs. warmth) within-subjects design.

TABLE 1 | Ten pairs of traits in the trait-rating task of the pilot study.

	Positive	Negative
Competence traits	Smart	Muddleheaded
	Vigilant	Numb
	Self-confident	Self-contemptuous
	Resourceful	Helpless
	Indecisive	Decisive
Warmth traits	Friendly	Unfriendly
	Upright	Cunning
	Genuine	Hypocritical
	Enthusiastic	Indifferent
	Modest	Supercilious

According to the calculation of the G*Power 3.1 (https://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3 Faul et al., 2009; a presupposed medium effect size of 0.25 and being significant at the 0.05 level), on a voluntary basis, we recruited 40 undergraduates to participate in the study (16 men, 24 women, $M_{age} = 21.66$ years old, ranging from 20.92 to 23.08). All participants were assigned the informed content before starting the task. For their participation, they can choose to get 10 RMB cash or a small gift worth 10 RMB.

Materials and Procedure

Participants participated in the pilot study in a group of 6–8. Upon arriving at the lab, they were told that they would take part in an impression formation task, and if they agreed, they needed to assign the informed content. After that, we introduced the trait-rating task for participants.

The trait-rating task consisted of two targets needing to be evaluated—*leaders* and *ordinary people*. In Chinese culture, "leader" refers to those HP individuals in a general way, and "ordinary people" refers to those LP individuals in a general way. Besides such two evaluated targets, the task included 10 pairs of traits, which were selected from previous research (Zhang et al., 2013; Wang et al., 2017). Such 10 pairs of traits included 5 pairs of competence traits and 5 pairs of warmth traits, and each pair consisted of two traits with opposite meanings (e.g., smart vs. muddleheaded). These traits were listed in **Table 1**. For each target, participants needed to mark a number on an 11-point scale (ranging from −5 to 5) to indicate which of each pair was more suitable to describe the target, and to what extent it was suitable to describe the target. Specifically, if participants marked a negative number on the scale, it means that the negative trait was considered to be more suitable to describe the target group and vice versa. Under this logic, "−5" implied that the negative trait was very suitable for the target group, and "5" implied that the oppositely positive trait was very suitable for the target group. In this way, for each target, participants were asked to give their ratings across all 10 pairs of traits. The presentation order of the targets was counterbalanced across participants.

After completing the trait-rating task, participants needed to provide necessary demographic information. Then, we expressed our thanks to them and answered their questions about the study.

TABLE 2 | Participants' average rating score in each condition of the pilot study ($M \pm SD$).

	HP target	LP target
Competence	3.55 ± 0.87	0.42 ± 1.46
Warmth	−0.28 ± 2.33	2.12 ± 1.24

N = 40. HP, high power; LP, low power.

Finally, we gave each participant a small gift or 10 RMB cash (following their preference) and guided them to leave the lab.

Results

For each participant, we calculated his/her rating scores toward each target by separately averaging the scores on the competence and warmth dimensions. Thus, four types of scores were generated for each participant: HP-competence, HP-warmth, LP-competence, and LP-warmth. Preliminary analyses did not reveal any significant main effect of gender or interaction effect with other variables, so we dropped this variable from formal data analyses. To assess how the ratings of targets varied with target power and stereotype dimension, we conducted a 2 (target power: high vs. low) × 2 (stereotype dimension: competence vs. warmth) within-subjects ANOVA. Mean (M) and standard deviation (SD) in each condition were presented in **Table 2**. The results of this ANOVA analysis showed a significant main effect of target power, $F_{(1,39)} = 4.71$, $p = 0.04$, partial $\eta^2 = 0.11$, with higher score for the HP target than for the LP target ($M = 1.63, 1.27$, respectively). In addition, the main effect of stereotype dimension also was significant, $F_{(1,39)} = 24.58$, $p < 0.001$, partial $\eta^2 = 0.39$, with higher score on the competence dimension than on the warmth dimension ($M = 1.98, 0.92$, respectively). However, the above significant main effects were qualified by a significant interaction between target power and stereotype dimension, $F_{(1,39)} = 99.87$, $p < 0.001$, partial $\eta^2 = 0.72$. Further simple effect analyses showed that participants indicated a higher score on the competence dimension for the HP target than for the LP target, $t_{(39)} = 11.22$, $p < 0.001$, d = 2.6. By contrast, on the warmth dimension, participants indicated a higher score for the LP target than for the HP target, $t_{(39)} = 6.64$, $p < 0.001$, d = 1.29. Simple effect analyses from the other direction showed that participants indicated a higher score on the competence dimension than on the warmth dimension for the HP target, $t_{(39)} = 8.71$, $p < 0.001$, d = 2.18, and showed the opposite results pattern for the LP target, $t_{(39)} = 7.46$, $p < 0.001$, d = 1.25.

Discussion

Supporting our hypothesis 1, the results of the pilot study demonstrated that participants tended to evaluate HP individuals as highly competent but with low warmth, and evaluate LP individuals as low competence but high warmth. The pilot study not only conceptually replicated previous power stereotype literature (Russell and Fiske, 2008; Fragale et al., 2009; Zhang et al., 2013), but also provided a theoretical and statistical basis for our further investigation of power stereotypes. In the trait-rating task of the following Study 1, target power would be subdivided

into senior HP, junior HP, and LP, so that we can assess whether there would be significant differences in the stereotypes between senior and junior HP individuals.

STUDY 1

In the above pilot study, we employed the trait-rating task to assess the stereotypes about HP and LP individuals. Consistent with our hypothesis 1, the results demonstrated that participants tended to rate HP individuals as positive competence but negative warmth, and rate LP individuals as negative competence but positive warmth. Based on this, Study 2 further classified the rated targets into senior HP, junior HP, and LP targets and examined the power stereotypes in a more subtle way. More concretely, our major concern in Study 1 was whether there were any differences in the stereotypes between senior and junior HP individuals. According to our hypothesis 2, we speculated that compared to junior HP individuals, senior HP individuals tended to be perceived as more positive warmth. It should be explained in advance that although our core concern in Study 1 was the warmth comparison between senior and junior HP targets, to avoid disrupting participants' perceived integrity and comprehensiveness about the trait-rating task, participants in Study 1 still needed to give their evaluations about targets on both competence and warmth dimensions.

Participants and Design

Study 1 was a 3 (target power: senior HP vs. junior HP vs. LP) × 2 (stereotype dimensions: competence vs. warmth) within-subjects design. According to the calculation of G*Power 3.1 (Faul et al., 2009), at least 28 participants can meet the criterion of a medium effect size of 0.25 and significance at a 0.05 level. Considering possible invalid data, we finally recruited 32 undergraduates to participate in the study. All participants were assigned the informed content before the formal task. For their participation, participants can get 10 RMB cash or a small gift worth 10 RMB.

Materials and Procedure

This section was identical to that of the pilot study except that participants needed to give their ratings for three types of targets in the trait-rating task—*senior leader*, *junior leader*, and *ordinary people*. We told participants that, the "senior leader" generally refers to those senior HP individuals who are primarily responsible for managing junior HP individuals rather than ordinary people in a society or employees in a company. And the "junior leader" generally refers to junior HP individuals who are primarily responsible for managing ordinary people in a society or employees in a company. As for the "ordinary people", they generally refer to those people who have little power and are managed by HP individuals. Similar to the pilot study, for each target, participants needed to mark a number on an 11-point scale (ranging from −5 to 5) to indicate which of each pair was more suitable to describe the target, and to what extent it was suitable to describe the target. Again, the presentation order of the targets was counterbalanced across participants.

After the trait-rating task, participants needed to provide necessary demographic information. Then, we expressed our thanks to them and answered their questions about the study. Finally, they got a small gift or 10 RMB cash (following their preference) and left the lab.

TABLE 3 | Participants' average rating score in each condition of Study 1 ($M \pm SD$).

	Senior HP target	Junior HP target	LP target
Competence	3.32 ± 1.37	1.51 ± 1.52	−0.76 ± 1.54
Warmth	0.67 ± 2.36	−1.43 ± 1.60	1.58 ± 1.65

N =32. HP, high power; LP, low power.

Results

As did in the pilot study, we calculated each participant's rating scores toward each target by separately averaging the scores on the competence and warmth dimensions. The average score of all participants in each condition was presented in **Table 3**.

Again, preliminary analyses showed that gender did not produce a significant main effect or any significant interaction effects with other variables, so this variable was dropped from the formal data analyses. Then, a 3 (target power: senior HP, junior HP, LP) × 2 (stereotype dimension: competence vs. warmth) within-subjects ANOVA was conducted to examine how participants' rating scores varied with target power and stereotype dimension. This ANOVA analysis revealed a significant main effect of target power, $F_{(2,62)} = 25.23$, $p < 0.001$, partial $\eta^2 = 0.45$. *Post-hoc* multiple comparisons showed that the rating score toward the senior HP target was significantly higher than the other two targets, ps < 0.001, and no significant difference was found between the junior HP target and the LP target, $p > 0.05$ ($M_{\text{senior}} = 1.99$, $M_{\text{junior}} = 0.04$, and $M_{\text{LP}} = 0.41$). The main effect of stereotype dimension was significant, $F_{(1,31)} = 18.38$, $p < 0.001$, partial $\eta^2 = 0.37$, as a higher score on the competence dimension than on the warmth competence ($M = 1.36, 0.28$, respectively). Importantly, the expected interaction effect between target power and stereotype dimension was significant, $F_{(2,62)} = 48.15$, $p < 0.001$, partial $\eta^2 = 0.61$. Simple effect analyses showed that on the competence dimension, the main effect of target power was significant, $F_{(2,62)} = 57.6$, $p < 0.001$, partial $\eta^2 = 0.65$. Planned comparisons revealed that participants indicated a higher score for the both senior and junior HP targets than for the LP target, ts > 5.99, ps < 0.001, ds > 1.48, and they also indicated a higher score for the senior HP target than for the junior HP target, $t_{(31)} = 5.1$, $p < 0.001$, d $= 1.25$. On the warmth dimension, the main effect of target power also was significant, $F_{(2,62)} = 22.84$, $p < 0.001$, partial $\eta^2 = 0.42$. Planned comparisons showed that participants indicated a significantly higher score for the LP target than for the junior HP target, $t_{(31)} = 7.64$, $p < 0.001$, d $= 1.86$, and indicated a slightly higher score for the LP target than for the senior HP target, $t_{(31)} = 1.94$, $p = 0.06$, d $= 0.45$. Importantly, in line with our speculation, participants indicated a significantly higher score for the senior HP target than for the junior HP target, $t_{(31)} = 4.22$, $p < 0.001$, d $= 1.04$. Overall, the further data analyses for the interaction between the power target and stereotype dimension

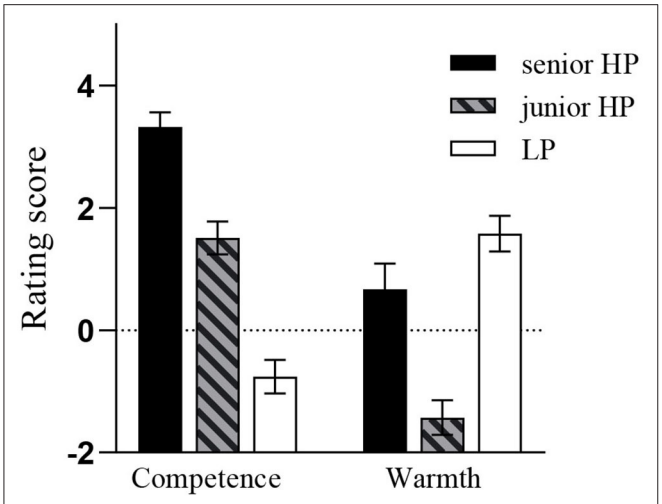

FIGURE 1 | The interaction effect between stereotype dimension and target power in Study 1 was illuminated schematically. Error bar means standard error.

suggested that participants generally tended to rate the HP targets as positive competence but negative warmth in comparison with the LP target, but the comparisons between the senior and junior HP targets showed that on both competence and warmth dimensions, participants gave more positive evaluations for the senior HP target than for the junior HP target. The schematic illustration for the interaction between power target and stereotype dimension was presented in **Figure 1**.

Discussion

In Study 1, we classified power into senior HP, junior HP, and LP, then we used the trait-rating task to investigate the contents of power stereotypes. The results showed that consistent with the results of the pilot study, the HP targets, in general, were perceived as positive competence but negative warmth in comparison with the LP target. More importantly, supporting our hypothesis 2, Study 1 found that, compared with the junior HP target, participants were inclined to indicate more positive warmth evaluations for the senior HP target—the so-called MPMW effect. Indeed, not only that, but participants also gave more positive competence evaluations for the senior HP target than for the LP target. That is to say, participants indicated more positive evaluations on both competence and warmth dimensions for the senior HP target.

For the above result, we would give our interpretation, respectively, from the competence and warmth dimensions. It is a well-accepted view that competence is a basic approach to constituting power (Guinote and Vescio, 2010; Rucker et al., 2018). So, on the both intuitive and theoretical levels, it is easy to understand the phenomenon that more power was associated with higher competence. About the MPMW effect on the warmth dimension, so far there were two plausible explanations. One explanation was the Confucian explanation that we have documented. According to our reasoning, Confucianism has been the dominant philosophy in China for a long time, so most individuals in China remain high identification with the doctrines of Confucianism (Fung, 1948/2018). As a consequence, individuals under Confucian culture tend to believe that greater power represents greater social responsibility. Correspondingly, senior HP individuals are more likely to be considered to possess positive warmth traits than junior HP individuals. Under this vein, individuals' identification with Confucianism is the key factor for the appearance of the MPMW effect on HP stereotypes. Another seemingly plausible explanation was the "halo effect". That means the MPMW effect on HP stereotypes is actually just because participants indiscriminately gave more positive evaluations toward senior HP individuals due to their greater power compared to junior HP individuals. In the following Study 2a and 2b, we would conduct empirical tests for such two explanations.

STUDIES 2A AND 2B

In Study 1, we classified power into senior HP, junior HP, and LP, and then applied the trait-rating task to investigate the contents of power stereotypes. Consistent with our hypothesis 2, we found the MPMW effect on HP stereotypes—more power was associated with more positive competence and warmth. Regarding this effect, there seemed to be two possible explanations: the Confucianism explanation and the "halo effect" explanation. So, the major aim of Study 2a and 2b was to further clarify which of the two explanations was appropriate for the MPMW effect observed in Study 1.

To this end, in Study 2a, we would select some participants who highly identified with Confucianism and some other participants who less identified with Confucianism to compare the power stereotypes among these participants. The underlying logic was that if participants' identification with Confucianism was the premise for the MPMW effect as we have mentioned, participants highly identifying with Confucianism would indicate more positive evaluations on both competence and warmth dimensions for senior HP target than for junior HP target, but for those individuals less identifying with Confucianism, they would indicate more positive evaluations for the senior HP individuals only on the competence dimension. By contrast, if the "halo effect" could account for the perceived more positive warmth for the senior HP target, participants should indicate more positive evaluations for senior HP individuals on both competence and warmth dimensions regardless of their identification with Confucianism. In Study 2b, we would further compare the warmth perceptions of participants from Chinese and Western cultures. Consistent with Study 2a, we speculated that Chinese participants would indicate more positive evaluations on both competence and warmth dimensions for the senior HP target than for the junior HP target while participants from Western culture would indicate more positive evaluations for the senior HP target on the competence dimension but not on the warmth dimension.

Participants and Design

In Study 2a, there were a total of 129 participants taking part in the study on a voluntary basis (56 men, 73 women, $M_{age} = 19.24$, ranging from 17.83 to 21.75). The sample size was determined by referring to Wang and Feng (2017) work in which the research design was similar to that of the present research. For their participation, they can get 10 RMB cash or a small gift worth 10 RMB. All participants were assigned the informed consent before the formal task.

Study 2b was an online study. According to the calculation of G*Power 3.1 (Faul et al., 2009), the presupposed 0.1 effect size and the 0.05 significance require at least 216 participants involved in this study. Considering possible invalid data, we finally recruited 240 participants to take part in the study. All participants were recruited via Credamo, a professional data collection platform (https://www.credamo.com). Half of the participants were recruited from China-mainland ($M_{age} = 24.83$, ranging from 19.33 to 54.75, 42 men, 78 women), and the other half were recruited from America, a typically Western country ($M_{age} = 34.54$, ranging from 18.92 to 55.98; 44 men, 76 women; 115 whites, 3 blacks, 2 Asians). Chinese participants completed the Chinese version of the task and Western participants completed the English version of the task. The two versions were developed by two psychological Ph.D. students who are proficient in both Chinese and English. Before the formal task, all participants needed to learn about the academic purpose of the research, and they could continue the task only after indicating their consent to the research. For their participation, they would receive 10 RMB (for Chinese participants) or 2 USD (for Western participants).

The key design of Study 2a was a 2 (target power: senior HP vs. junior HP) × 2 (stereotype dimension: competence vs. warmth) × 2 (Confucianism identification: high vs. low) mixed-measures ANOVA with Confucianism identification as the between-subjects variable. Those participants belonging to two Confucianism-identification conditions were selected from the total of 129 participants. Additionally, with all participants, we also conducted a 2 (target power: senior HP vs. junior HP) × 2 (stereotype dimension: competence vs. warmth) within-subjects ANOVA to conceptually replicate the findings of Study 1. The design of Study 2b was a 2 (target power: senior HP vs. junior HP) × 2 (stereotype dimension: competence vs. warmth) × 2 (cultural background: Chinese culture vs. Western culture) mixed-measures ANOVA with a cultural background as the between-subjects variable.

Materials

The Trait-Rating Task

The trait-rating task of Study 2a and 2b was identical to that of Study 1 except that the evaluated targets only included senior and junior HP targets. That means, the task consisted of 10 pairs of traits and two targets. For each pair of traits, participants needed to mark a number on an 11-points scale (ranging from −5 to 5) to demonstrate which trait and to what extent it was suitable to describe the target.

Measuring Participants' Identification With Confucianism

To our knowledge, no available scale so far can be used to assess participants' identification with Confucianism. Given that, following previous research (Gloor, 2021), a self-developed scale was applied to measure participants' identification with Confucianism. To develop this Confucianism identification scale, we firstly invited 3 undergraduates to write 5 sentences for each person which can reflect the propositions of Confucianism about how people should exert their power. Then, we invited another 10 postgraduates to evaluate on a 5-points scale to what extent each sentence was in conformity with Confucianism (1 = *extreme disconformity*, 5 = *extreme conformity*). Finally, the average score on each sentence was sorted in descending order and the top 3 sentences were selected to constitute the Confucianism identification scale. The scale was developed in Chinese and English two versions and the English version was listed here: (1) in my view, individuals with greater power should display more benevolence toward others; (2) if one person possesses social power, he/she should pay more attention to the livelihood of ordinary people; (3) those people with great social power generally have a high degree of social responsibility rather than only pursue their own enjoyment. Participants' identification with Confucianism was assessed by summarizing the score on each item of the scale. In the current research, the internal consistency of the scale was 0.84.

Additional Measures

In Study 2a, we developed two additional items to assess the extent to which participants have access to HP individuals. One is "in daily life, I actually have less chance to interact with senior HP individuals", and the other is "frankly speaking, compared to junior HP individuals, I form the impressions about senior HP individuals to a greater extent based on my subjective feelings". Considering that previous research has suggested that the differences in perceived competitiveness can evoke the differences in perceived warmth in interpersonal communication (Russell and Fiske, 2008), in Study 2b, participants were asked to report perceived competitiveness among senior and junior HP individuals.

Procedure

Study 2a was conducted in the lab, the procedure of which was partially identical to that of Study 1. Specifically, participants arrived at the lab in a group of 8–10. Upon arrival, they were told that they would complete several impression formation tasks and then signed the informed consent. The first task was the trait-rating task which was identical to that of Study 1 except that there were only senior and junior HP targets. Following the trait-rating task, participants continued to complete the Confucianism identification scale on another page, and they also reported their interacting frequency with HP individuals. After that, we collected the necessary demographic information of participants and answered any questions about the study. Finally, we gave them a small gift of 10 RMB and guided them to leave the lab.

The data of Study 2b was collected online via the Credamo platform. Prior to the formal task, the participants

needed to indicate their consent to the research. Then, they successfully completed the trait-rating task and the Confucianism identification scale. They also reported necessary demographic information. After completing all tasks, participants would receive their payments.

Results

Data Analyses in Study 2a

The MPMW Effect on HP Individuals

One participant was dropped from data analyses because of excessive omissions. So, a total of 128 participants were included in the final data analyses. Preliminary analyses did not reveal any significant effects relevant to gender, this variable thus was not included in further data analyses. To investigate how participants' rating scores varied with target power and stereotype dimension, we conducted a 2 (target power: senior HP vs. junior HP) × 2 (stereotype dimension: competence vs. warmth) within-subjects ANOVA. The results revealed a significant main effect of power, $F_{(1,127)} = 76.47$, $p < 0.001$, partial $\eta^2 = 0.38$, as a higher score for the senior HP target than the junior HP target ($M = 2.25$, 0.92, respectively). The ANOVA also revealed a significant main effect of stereotype dimension, $F_{(1,127)} = 127.86$, $p < 0.001$, partial $\eta^2 = 0.5$, with a higher score on the competence dimension than on the warmth dimension ($M = 2.3$, 0.86, respectively). In addition, the interaction between power and stereotype dimension was significant, $F_{(1,127)} = 17.44$, $p < 0.001$, partial $\eta^2 = 0.12$. Simple analyses showed that the senior HP target was evaluated as more positive than the junior HP target on the both competence and warmth dimensions, but the differences between two targets were more significant on the competence dimension than on the warmth dimension, $t_{(127)\text{competence}} = 11.93$, $p < 0.001$, d = 1.33, $t_{(127)\text{warmth}} = 3.33$, $p = 0.001$, d = 0.35. The above results suggested that consistent with Study 1, Study 2a also revealed the MPMW effect on HP stereotypes.

The Moderating Role of Participants' Confucianism Identification for the MPMW Effect

To test whether participants' identification with Confucianism was the premise for the MPMW effect (hypothesis 3), we selected the data of those participants who display obviously high and low identities with Confucianism for further data analyses. Specifically, we first sorted the database in descending order by participants' rating scores on the Confucianism identification scale. Then, following previous research (Zou et al., 2007; Wang and Feng, 2017), we selected the top 20% cases as participants with high Confucianism identification ($M = 14.23$, $SD = 0.86$), and the bottom 20% cases as participants with low Confucianism identification ($M = 5.82$, $SD = 1.19$). An independent T-test showed that there was a significant difference in the rating scores on the scale between them, $t_{(50)} = 29.12$, $p < 0.001$, d = 8.23. As a consequence, a total of 52 participants were submitted into a 2 (target power: senior vs. junior) × 2 (stereotype dimension: competence vs. warmth) × 2 (Confucianism identification: high vs. low) mixed-measures ANOVA, with Confucianism identification as the between-subjects variable. Participants' average rating score in each condition was presented in **Table 4**.

TABLE 4 | Participants' average rating score in each condition of Study 2a and 2b ($M \pm SD$).

		Senior HP target	Junior HP target
Study 2a			
High Confucianism identification	Competence	3.67 ± 1.23	1.65 ± 1.51
	Warmth	2.43 ± 1.80	−0.49 ± 1.53
Low Confucianism identification	Competence	2.88 ± 1.06	1.12 ± 1.65
	Warmth	−0.08 ± 2.12	0.45 ± 2.07
Study 2b			
Chinese culture	Competence	3.27 ± 1.06	1.18 ± 1.56
	Warmth	0.87 ± 2.03	0.07 ± 2.29
Western culture	Competence	2.37 ± 2.06	2.15 ± 2.04
	Warmth	2.19 ± 2.01	2.21 ± 2.00

N = 52 in Study 2a, N = 226 in Study 2b. HP, high power; LP, low power.

The above ANOVA revealed that the main effect of target power was significant, $F_{(1,50)} = 41.93$, $p < 0.001$, partial $\eta^2 = 0.46$, and the subsequent *post-hoc* comparison showed that participants indicated a higher scores for the senior HP target than for the junior HP target, $t_{(51)} = 8.73$, $p < 0.001$, d = 0.97. The main effect of stereotype dimension was also significant, $F_{(1,50)} = 70.94$, $p < 0.001$, partial $\eta^2 = 0.59$, as a higher score on the competence dimension than on the warmth dimension, $t_{(51)} = 8.45$, $p < 0.001$, d = 1.13. Additionally, the interaction between target power and Confucianism identification was significant, $F_{(1,50)} = 15.17$, $p < 0.001$, partial $\eta^2 = 0.23$. However, this significant interaction was qualified by another significant interaction effect among target power, stereotype dimension, and Confucianism identification, $F_{(1,50)} = 17.35$, $p < 0.001$, partial $\eta^2 = 0.26$.

For the significant effect among target power, stereotype dimension, and Confucianism identification, the subsequent simple effect analyses revealed that the interaction between target power and stereotype dimension was significant for participants who have low identification with Confucianism, $F_{(1,25)} = 35.46$, $p < 0.001$, partial $\eta^2 = 0.59$, whereas the interaction between them was not significant for participants who have high identification with Confucianism, $F_{(1,25)} = 1.86$, $p = 0.19$, partial $\eta^2 = 0.07$. Further planned analyses showed that participants with high Confucianism identification indicated a higher score for the senior HP target than for the junior HP target on both competence and warmth dimensions, ts > 4.93, ps < 0.001, but this pattern was changed for those participants with low Confucianism identification. In concrete terms, on the competence dimension, participants with low Confucianism identification indicated a significantly higher score for the senior HP target than for the junior HP target, $t_{(25)} = 4.67$, $p < 0.001$, d = 1.24 ($M = 2.88$, 1.12, respectively); however, on the warmth dimension, there were no significant differences about the scores between senior and junior HP targets, $t_{(25)} = 1.39$, $p = 0.18$, d = −0.25 ($M = -0.08$, 0.45, respectively). Simply

speaking, the MPMW effect on HP stereotypes was moderated by participants' identification with Confucianism—participants with high Confucianism identification, rather than those with low Confucianism identification, were inclined to display the MPMW effect (see **Figure 2**).

About the item "in daily life, I actually have less chance to interact with senior HP individuals", participants commonly alleged that they had less chance to interact with senior HP individuals", $M = 4.15$, $SD = 0.95$ (higher value indicates less interacting experiences), and this average value was significantly greater than the median 3, $t_{(127)} = 13.61$, $p < 0.001$, d = 1.21. Correspondingly, about the item "frankly speaking, compared to junior HP individuals, I form the impressions about senior HP individuals to a greater extent based on my subjective feelings", most participants also alleged that they formed the impressions of senior HP individuals to a greater extent based on their subjective feelings, $M = 4.1$, $SD = 1.03$, and again, this average value was significantly greater than the median 3, $t_{(127)} = 12.06$, $p < 0.001$, d = 1.07.

Data Analyses in Study 2b

The Moderating Role of Cultural Background for the MPMW Effect

A total of 14 participants were dropped from the following data analyses due to incomplete responses (1 participant) or failing to pass the attention check (5 Chinese participants, 8 Western participants). As a consequence, a total of 226 participants were included in the formal data analyses. Preliminary analyses did not reveal any significantly meaningful effects relevant to gender, so this variable was not considered in the formal data analyses. Then, we conducted a 2 (target power: senior vs. junior) × 2 (stereotype dimension: sociability vs. morality) × 2 (cultural background: Chinese culture vs. Western culture) mixed-measures ANOVA with a cultural background as the between-subjects variable. The average value in each condition was presented in **Table 4**. Consistent with Study 2a, the ANOVA revealed a significantly main effect of power, $F_{(1,224)} = 88.78$, $p < 0.001$, partial $\eta^2 = 0.28$, and a significant interaction effect between target power and stereotype dimension, $F_{(1,224)} = 22.45$, $p < 0.001$, partial $\eta^2 = 0.09$. However, such significant effects were qualified by a significant three-interaction effect among cultural background, target power and stereotype dimension, $F_{(1,224)} = 11.14$, $p = 0.001$, partial $\eta^2 = 0.05$.

To clarify the significant interaction effect among cultural background, target power and stereotype dimension, we conducted further simple effect analyses (see **Figure 3**). The results showed that, for Chinese participants, the effect of target power was significant, $F_{(1,113)} = 93.76$, $p < 0.001$, partial $\eta^2 = 0.45$, and the effect of stereotype dimension was significant, $F_{(1,113)} = 157.99$, $p < 0.001$, partial $\eta^2 = 0.58$. Moreover, the interaction effect between target power and stereotype dimension also was significant, $F_{(1,113)} = 18.22$, $p < 0.001$, partial $\eta^2 = 0.14$. For Western participants, the simple effect analysis only revealed a significant interaction effect between target power and stereotype dimension, $F_{(1,111)} = 5.43$, $p = 0.02$, partial $\eta^2 = 0.05$. The following simple-simple effect analyses showed that Chinese participants gave more positive evaluations for the senior HP target than for the junior HP target on both the competence and the warmth dimensions, but the significance on the competence dimension was stronger than that on the warmth dimension, $t_{(113)\text{competence}} = 12.92$, $p < 0.001$, d = 1.57, $t_{(113)\text{warmth}} = 3.14$, $p = 0.002$, d = 0.37; In contrast, Western participants only gave more positive evaluations for the senior target on the competence dimension, $t_{(111)} = 2.6$, $p = 0.01$, d = 0.11, but not on the warmth dimension, $t_{(111)} = 0.18$, $p = 0.86$.

In addition, we also compared participants' identification with Confucianism across cultures and perceived competitiveness between the senior and the junior targets. An independent *T*-test showed that Chinese participants displayed higher identification with Confucianism than Western participants ($M = 11.20$, 9.27, respectively), $t_{(224)} = 5.53$, $p < 0.001$, d = 0.74. With perceived competitiveness as the dependent variable, we performed a 2 (cultural background: Chinese culture vs. Western culture) × 2 (target power: senior vs. junior) mixed-measures ANOVA to examine whether there were differences in perceived competitiveness between senior and junior targets. This ANOVA revealed a significant effect of cultural background, $F_{(1,224)} = 7.38$, $p = 0.007$, partial $\eta^2 = 0.03$, with higher values for Western participants than for Chinese participants. However, the interaction effect between cultural background and target power was not significant, $F_{(1,224)} = 1.53$, $p = 0.22$, partial $\eta^2 = 0.007$, and the main effect of target power also was not significant, $F_{(1,224)} = 0.08$, $p = 0.77$. Taken together, such results suggested that there were no significant differences in perceived competitiveness between the senior and the junior targets.

Subsidiary Analyses

In Study 2a, we conducted subsidiary analyses to exclusively explore whether the effect of target power on participants' warmth perception varied with specific traits. Specifically, following previous research (Leach et al., 2007), we further classified five warmth traits into sociability and morality two sub-dimensions. To assess the feasibility of this classification, a CFA was conducted with participants' ratings on the warmth traits. The results showed a good mode fitness, $\chi^2/df = 1.18$, $p = 0.32$, $CFI = 0.99$, $TLI = 0.99$, $SRMR = 0.01$, $RMSEA = 0.04$, suggesting that our classification can be acceptable. Then, we performed a 2 (target power: senior vs. junior) × 2 (warmth sub-dimension: sociability vs. morality) within-subjects ANOVA with all participants in Study 2a. The results showed a significant main effect of target power, $F_{(1,127)} = 8.40$, $p = 0.004$, partial $\eta^2 = 0.06$, and a significant interaction effect between target power and warmth sub-dimension, $F_{(1,127)} = 23.21$, $p < 0.001$, partial $\eta^2 = 0.15$. The following simple effect analyses showed that participants indicated a significantly higher score for the senior HP target than for the junior HP target on the sociability sub-dimension ($M = 1.51$, 0.32, respectively), $t_{(127)} = 4.66$, $p < 0.001$, d = 0.52, but there were no significant differences between two targets on the morality sub-dimension ($M = 0.87$, 0.7, respectively), $t_{(127)} = 0.67$, $p = 0.51$, d = 0.07.

Discussion

Consistent with the results of Study 1, Study 2a also showed that compared to the junior HP target, the senior HP target tended

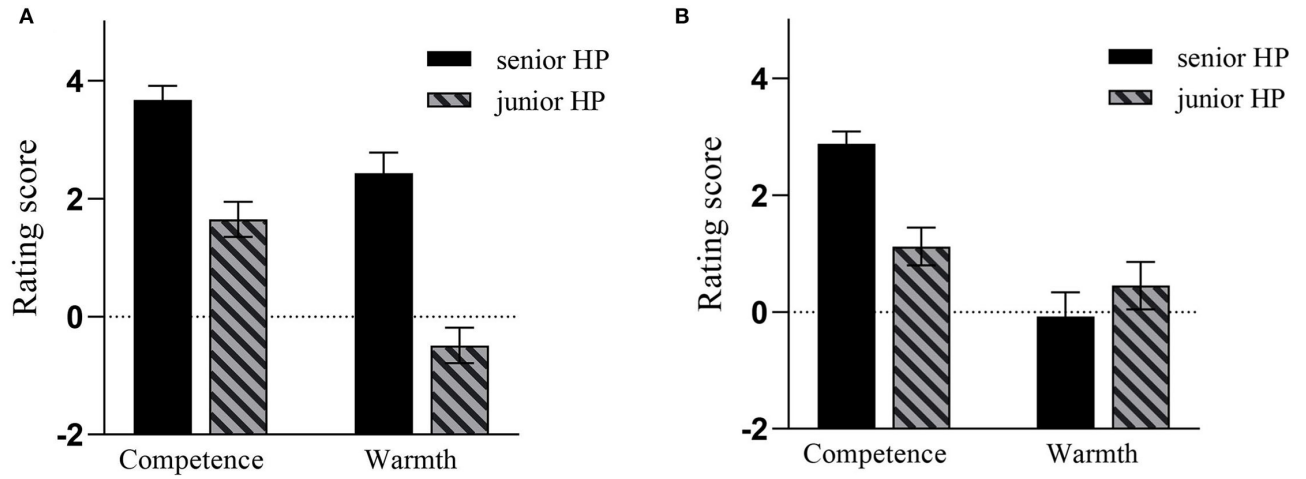

FIGURE 2 | For participants with high Confucianism identification **(A)** and participants with low Confucianism identification **(B)** in Study 2a, the average rating score in each condition was presented schematically. Error bar means standard error.

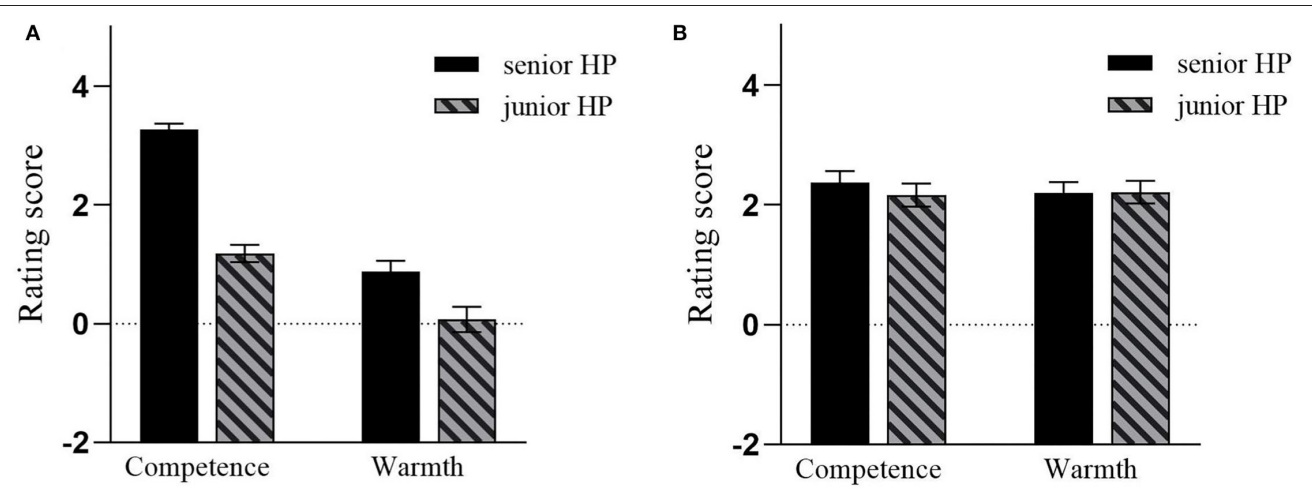

FIGURE 3 | For Chinese participants **(A)** and Western participants **(B)** in Study 2b, the average rating score in each condition was presented schematically. Error bar means standard error.

to be perceived as more positive on the warmth dimension, thus providing the collaborating evidence for our hypothesis 2. For the MPMW effect on the warmth dimension, as we have mentioned in Study1, the Confucianism explanation and the "halo effect" explanation were both plausible explanations. However, in Study 2a, when we intentionally selected some participants displaying high/low identification with Confucianism, we found that participants with high Confucianism identification indicated more positive evaluations for the senior HP target on both competence and warmth dimensions, but for participants with low Confucianism identification, they gave the senior HP target more positive evaluations only on the competence dimension. Although the "halo effect" hypothesis could explain the result that participants with high Confucianism identification gave the senior HP target more positive evaluations on both competence and warmth dimensions, it could not explain why participants with low Confucianism identification gave the senior HP target more positive evaluations only on the competence dimension. Thus, the "halo effect" hypothesis can be basically eliminated from our research. Thus, Study 2a provided the initial support for our Confucianism explanation.

In Study 2b, we conducted a cross-cultural study and found that the MPMW effect emerged for Chinese participants but not for Western participants. Moreover, this perceived warmth difference between senior and junior HP targets could not be explained by the perceived competitiveness between senior and junior HP targets. Additionally, our subsidiary analyses showed that when those warmth traits were distinguished as sociability and morality, participants gave more positive evaluations for the senior HP target than for the junior HP target on the sociability

sub-dimension, but not on the morality sub-dimension. This result suggested that participants' relatively negative warmth perception about the junior HP target may stem from their negative expectation about the social agreeableness of junior HP individuals, which to some extent provided additional support for our Confucianism explanation. Taken together, by measuring participants' identification with Confucianism on the individual level and conducting a cross-cultural study, the results of Study 2a and 2b consistently demonstrated that participants' identification with Confucianism was the premise for the MPMW effect.

STUDY 3

In Study 2a, by deliberately selecting some participants with high/low Confucianism identification under Chinese culture, we found that the MPMW effect emerged for participants with high Confucianism identification but not for participants with low Confucianism identification. In Study 2b, by conducting a cross-cultural study including Chinese and Western participants, we found that the MPMW effect emerged for Chinese participants but not for Western participants. The results of Study 2a and 2b consistently provided explicit evidence for our hypothesis 3 that participants' Confucianism identification was the premise for the MPMW effect on HP stereotypes. In Study 3, we aimed to provide implicit evidence for the role of Confucianism identification in the MPMW effect. Specifically, in Study 3, we would apply the IAT to measure participants' power stereotypes on the implicit level. The IAT, originally developed by Greenwald et al. (1998), has been widely used to measure the implicit association strength of multiple stereotypes (Lai and Wilso, 2020). Compared to explicit measures, the IAT was considered to be less susceptible to social desirability effects, and thus more likely to detect individuals' internal "unshaped" beliefs (Nosek et al., 2011; Lai and Wilso, 2020). Thus, in the current research, the IAT was used to further confirm the MPMW effect on HP stereotypes and specify the condition for the emergence of the phenomenon.

In Study 3, we sought to use the priming technique to temporarily reduce participants' identification with Confucianism, and then examine the role of Confucianism in the emergence of the MPMW effect. Specifically, we randomly assigned participants to the control and the counter-Confucianism conditions. Under the control conditions, participants firstly read two paragraphs irrelevant to Confucianism and then completed the IAT. Under the counter-Confucianism condition, participants firstly read two paragraphs conveying the gist in opposition to Confucianism and then completed the IAT. More detailed descriptions about the IAT were provided in the Section Materials.

In the IAT, we defined senior and junior HP labels as target dimensions and defined positive and negative warmth traits as attribute dimensions. Because previous explicit results suggested that on the warmth dimension, participants gave senior HP individuals more positive evaluations than junior HP individuals, in the IAT, the combinations of "senior HP—positive warmth" and "junior HP—negative warmth" were defined as the compatible responses, and the combinations of "senior HP—negative warmth" and "junior HP—positive warmth" were defined as the incompatible responses. Following previous research (Greenwald et al., 2003), the calculated D value was the indicator of implicit association strength of HP stereotypes and greater D values represented stronger strength of HP stereotypes. According to our reasoning, we speculated that when the counter-Confucianism information was presented, the D value would be significantly lower under the counter-Confucianism condition than that under the control condition (no counter-Confucianism information).

Participants

According to the calculation of G*Power 3.1 (Faul et al., 2009), a presupposed 0.8 effect size and 0.05 significance required at least 84 participants to participate in Study 3. Given this, on a voluntary basis, we finally recruited 85 undergraduates to take part in the study (27 men, 58 women, $M_{age} = 21.03$, ranging from 19 to 23.5). They all assigned the informed consent before the formal tasks.

Materials

The Reading-Comprehension Task

In Study 3, we used a so-called "reading-comprehension task" to present the counter-Confucianism information to participants. Concretely, in this so-called reading-comprehension task, approximately half of the participants were asked to read two passages that mainly told readers that although HP individuals under Confucian culture, including senior and junior HP individuals, alleged their social responsibility and benevolence for the whole society, they actually were likely to serve themselves by exerting their power. To increase the credibility of such counter-Confucianism materials, we provided some theoretical or practical evidence for our argument. To further reinforce the priming effect of the counter-Confucianism materials, all participants were required to extract and write the gist of each paragraph. Previous literature concerning gender stereotypes suggests that presenting the counter-stereotype materials to participants can effectively elevate the accessibility of stereotype-inconsistent information and reduce the strength of gender stereotypes (Dasgupta and Asgari, 2004). One of the two passages was translated into the English version and presented here as an example.

> *In China, when ordinary people suffer from unfair treatments from junior HP individuals, they prefer to ask for the assistance from senior HP individuals. As an example, in ancient China, those people who dare to tell their suffering to the then emperor in a face-to-face way, even risking their lives, have been legends in the public mind. We can find many such legends in a variety of literary works. Indeed, this interesting phenomenon may root in the Confucian culture. Specifically, since the Han Dynasty, Confucianism has been the dominant culture in China, which proposes that a "qualified" HP person should have a high degree of social responsibility and devote his life to serving for the whole society. Due to this chronic influence of Confucianism, most Chinese people are willing to believe that more power is associated with more social responsibility. Thus, compared to junior HP individuals, senior HP individuals are considered to be more likely to help ordinary*

people solve problems. However, what about the facts? Psychological research indicates that power can increase psychological distance from others. That means, the more power one person holds, the less motivation to interact with others. Correspondingly, it actually is a difficult thing for HP individuals to pay much attention to others, especially to ordinary people. As a consequence, although Confucianism alleges that more power represents more social power and most people also believe that that's the case, unfortunately, once holding power, regardless of senior or junior HP individuals, they may do not have enough motivation to actively help ordinary people solve problems.

It should be noticed that the counter-Confucianism materials did not explicitly contain descriptions literally at odds with HP stereotypes (e.g., senior HP individuals commonly are hypocritical). Rather, the counter-Confucianism materials conveyed the implications contrary to the doctrines of Confucianism. That is, once holding power, regardless of senior or junior HP individuals, they will be less motivated to pay much attention to others; in contrast, they are more likely to afford their own needs by exerting their power. Thus, in the counter-Confucianism condition, we sought to reduce the implicit association strength of HP stereotypes by temporarily reducing participants' identification with Confucianism. In the control condition, the other half of the participants read two neutral materials which were both matched with the experimental materials in length and readability. One of the two passages introduced some UFO incidents in the past several decades, and the other introduced the formation and evolution of Antarctic glaciers. Participants in the experimental and control conditions were both instructed to complete the reading-comprehension task within 10 min.

The IAT Task

In Study 3, the classic IAT was employed to assess the strength of HP stereotypes across two conditions. In the IAT task, the target dimension consisted of 8 HP labels (4 senior HP and 4 junior HP) and the attribute dimension consisted of 16 warmth traits (8 positive traits and 8 negative traits). All target and attribute words were selected from previous relevant research and listed in **Table 5** (Zhang et al., 2013; Wang et al., 2017).

The IAT task was run by E-prime 3.0 on the computer. The classic IAT included 7 parts. At the beginning of each part, a task instruction was presented on the computer screen until participants pressed the space key, and then, participants needed to classify each stimulus by pressing the *E* or *I* key. In part 1, participants were instructed to classify 24 warmth traits into the "positive" or "negative" category. The 24 warmth traits consisted of all 16 warmth traits and the selected 8 traits from them in a pseudo-random way (4 positive warmth traits and 4 negative warmth traits). They needed to press the *E* key if a positive word was presented and they needed to press the *I* key if a negative word was presented. When they pressed the wrong key, the feedback "wrong response (in Chinese)" would be presented on the screen. Similarly, participants needed to classify 24 target labels into the "senior HP" or "junior HP" category (8 HP labels were presented three times) in part 2. They needed to press the *E* key for senior HP labels and press the *I* key for junior HP labels. Again, the feedback "wrong response" would be presented on the screen upon participants pressing an incorrect key. The main purpose of parts 1 and 2 was to make participants familiar with experimental stimuli and correct key-press.

TABLE 5 | HP labels on the target dimension (senior vs. junior) and warmth traits (positive vs. negative) on the attribute dimension in the IAT of Study 3.

Target dimension		Attribute dimension	
Senior HP	**Junior HP**	**Positive warmth**	**Negative warmth**
Minister	Section Chief	Friendly	Unfriendly
Board Chairman	Workshop Manager	Upright	Cunning
Director General	Community Director	Genuine	Hypocritical
Senior officials	Village Secretary	Enthusiastic	Indifferent
		Modest	Supercilious
		Easy-going	Domineering
		Amiable	Rigid
		Altruistic	Self-serving

IAT, implicit association task; HP, high power; LP, low power.

Part 3 and 4 were compatible combination-response parts. As we have mentioned above, we proposed that on the relative level, participants tended to associate senior HP labels with positive warmth traits and associate with junior HP labels with negative warmth traits. So, in part 3, participants needed to press the *E* key when senior HP labels or positive warmth traits were presented on the screen, and they needed to press the *I* key when junior HP labels or negative warmth words were presented on the screen. The task demand of part 4 was identical to that of part 3 except for the trial quantity—part 3 consisted of 24 trials and Block 4 consisted of 48 trials.

In part 5, participants made the key-press contrary to part 1. That is, they needed to press the *E* key for negative warmth traits and press the *I* key for the positive warmth traits. To make participants fully familiar with this new key-press, part 5 consisted of 48 trials.

Parts 6 and 7 were incompatible combination-response parts in which participants needed to press the *E* key for senior HP labels or negative warmth traits and press the *I* key for junior HP labels or positive warmth traits. Similar to parts 3 and 4, part 6 consisted of 24 trials and part 7 consisted of 48 trials. In general, participants took about 15–17 min to complete the whole IAT task.

The Confucianism Identification Scale

In Study 3, the Confucianism identification scale was used to check the effectiveness of the counter-Confucianism priming. After completing the IAT task, participants needed to fill out the scale to compare whether there were significant differences in participants' identification with Confucianism between the counter-Confucianism and control conditions.

Procedure

Participants took part in the study in a group of 6 and they arrived at the lab at the appointed time. Upon arrival, they were told that they would complete two (ostensibly) unrelated tasks for the purpose of saving time. Firstly, they completed the reading-comprehension task in which approximately half of the participants read two passages containing the counter-Confucianism information and the other half read two paragraphs unrelated to Confucianism. After reading each paragraph, participants needed to write its gist in one sentence. Following the reading-comprehension task, participants continued to complete the IAT task. Then, participants filled out the Confucianism identification scale, and also provided necessary demographic information. Finally, they were thanked, debriefed, and guided to leave the lab. The whole task lasted about 25–30 min.

Results

The data of 2 participants (1 man, 1 woman) failed to be collected successively due to an unknown software error. Thus, a total of 83 participants were included in the final data analyses. Preliminary analyses showed that gender did not produce any significant main or interaction effects, so this variable was dropped from the following data analyses.

The Check for the Manipulation of the Counter-Confucianism Priming

During the debriefing session, no participant expressed suspicion about the authenticity of the presented stimulus in the reading-comprehension task. The effectiveness of the counter-Confucianism was estimated by summarizing each participant's score on three items of the Confucianism identification scale. The subsequent independent *T*-test revealed that participants in the counter-Confucianism condition reported a significantly lower score on the Confucianism identification scale than participants in the control condition, $t_{(81)} = 6.55$, $p < 0.001$, d = 1.44 ($M = 8.49$, 11.95, respectively), thus demonstrating the effectiveness of our manipulation. The presentation of the counter-Confucianism stimuli temporarily reduced the accessibility of Confucianism, and participants in the counter-Confucianism condition thus showed relatively lower identification with Confucianism.

The IAT Task

Following the recommendation by Greenwald et al. (2003), the D value of each participant was calculated as the indicator of the strength of HP stereotypes. Two one-sample *T*-tests revealed that the D values in the counter-Confucianism and control conditions were both significantly > 0, ts > 12.36, ps < 0.001, suggesting that participants in both conditions showed the MPMW effect on HP stereotypes. Then, we conducted an independent *T*-test to compare the D values between the counter-Confucianism and control conditions. The results showed that the D value in the counter-Confucianism condition was significantly smaller than the D value in the control condition, $t_{(81)} = 3.27$, $p = 0.002$, d = 0.72 ($M = 0.66$, 0.9, respectively), suggesting that the MPMW effect was significantly attenuated when presenting the counter-Confucianism materials.

Discussion

To further confirm the role of Confucianism in the MPMW effect, in Study 3, we used the priming technique to manipulate the accessibility of Confucianism and then applied the IAT task to compare the strength of the MPMW effect between the counter-Confucianism and control conditions. Consistent with our speculation, the D value in the counter-Confucianism condition was significantly lower than that in the control condition, suggesting the weaker stereotype strength in the counter-Confucianism condition. From the perspective of the accessible theory (Förster and Liberman, 2007; Higgins, 2012), when the counter-Confucianism stimuli were presented to participants, the temporarily accessible counter-Confucianism knowledge reduced participants' reliance on the chronically accessible Confucianism. As a reflection, the D value in the counter-Confucianism condition was significantly reduced than that in the control condition. Notably, despite significant differences in the D values between the counter-Confucianism and control conditions, the D values in both conditions were both significantly larger than zero. This finding suggested that the presentation of the counter-Confucianism information could reduce the MPMW effect, but it cannot eliminate the effect. Indeed, our finding was consistent with previous stereotype literature, which consistently demonstrated that although stereotypes display quite a flexibility and function, stereotypes are less likely to be completely eliminated (Fiske and Neuberg, 1990; Ellemers, 2018).

In Study 2, by measuring participants' identification with Confucianism on the individual level (2a) and selecting participants from Chinese and Western cultures (2b), we found that participants for whom Confucianism was chronically accessible knowledge, rather than participants for whom Confucianism was less accessible knowledge, tended to display the MPMW effect about HP stereotypes. In Study 3, we further found that when the accessibility of the counter-Confucianism information was temporarily elevated, participants showed a weaker MPMW effect in the IAT task. Thus, studies 2 and 3 provided compelling evidence for our hypothesis that Confucianism was a key premise for the MPMW effect on HP stereotypes—only when Confucianism is accessible in a specific situation, do individuals tend to associate more power with more warmth with HP stereotypes.

GENERAL DISCUSSION

In the current research, we classified power in a relatively continuous way and conducted 5 studies to mainly investigate the MPMW effect on HP stereotypes and the condition for the emergence of the effect. By using the trait-rating task, the pilot study replicated previous research and revealed that in comparison with LP individuals, HP individuals tended to be perceived as positive competence but negative warmth (Russell and Fiske, 2008; Fragale et al., 2009; Zhang et al., 2013, 2015; Wang et al., 2017). The following Study 1 demonstrated that

when HP was further divided into senior and junior HP, participants gave more positive evaluations on both competence and warmth dimensions for senior HP individuals than for junior HP individuals, thus providing initial evidence for the MPMW effect on HP stereotypes—more power tended to be associated with more perceived warmth about HP individuals. By enacting the trait-rating task in a larger sample, Study 2a further confirmed the MPMW effect on HP stereotypes. More importantly, Study revealed that the MPMW effect was more likely to emerge for participants with high Confucianism identification (2a) or participants from Confucianism-dominant culture (2b), thus suggesting that participants' identification with Confucianism may be a premise for the emergence of the MPMW effect. In Study 3, by presenting the Counter-Confucianism stimuli to temporarily reduce the accessibility of Confucianism, we found that the D value in the IAT under the Counter-Confucianism condition was significantly lower than that under the control condition. This result indicated that because of the decline of the Confucianism accessibility, the strength of the MPMW effect had been significantly reduced, thus providing convincing evidence for our hypothesis that participants' identification with Confucianism was the premise for the existence of the MPMW effect.

The MPMW Effect and Confucianism

Recently, Anicich et al. (2020) have pointed out that "an unstated premise in the social power literature is that an individual either has or lacks power", and a large body of literature also has exclusively focused on the static comparison between HP and LP individuals, thus to a great extent ignoring the dynamic nature of power (Anicich et al., 2020). Following the proposition by Anicich et al. (2020), the present research not only investigated the contents of power stereotypes about HP and LP individuals by adopting a simply dualistic classification approach (HP/LP) but also further divided HP into senior and junior HP by adopting a relatively continuous classification approach. The results showed that when adopting a dualistic classification approach for power, the current research kept consistent with previous research—participants tended to evaluate LP individuals as negative competent but positive warmth and evaluate HP individuals as positive competent but negative warmth. In a simple word, elevated power was considered to be associated with more negative warmth. However, when HP was subdivided into senior HP and junior HP, we found that the evaluation of senior HP individuals' warmth did not linearly become more negative along with the elevation of power, and in contrast, senior HP individuals were considered to display more positive warmth than junior HP individuals. Regarding this so-called MPMW effect on HP individuals, our research revealed that participants' identification with Confucianism was a key factor in its existence. When participants had less identification with Confucianism on the individual level or temporarily had relatively less identification with Confucianism due to experimental manipulation, the MPMW effect had been significantly reduced, even eliminated.

Additionally, we found that when comparing senior and junior HP individuals with LP individuals, participants, in general, gave more positive warmth evaluations for LP individuals than for HP individuals (including senior and junior HP individuals). In other words, the current research did not challenge previous literature which consistently demonstrates that LP individuals are considered to display more positive warmth than HP individuals (Cuddy et al., 2008; Russell and Fiske, 2008; Fragale et al., 2009; Zhang et al., 2013; Wang et al., 2017). That implies, under Confucian culture, although explicitly differentiating senior and junior HP individuals could evoke participants' positive expectations toward senior HP individuals, this could not completely counteract their negative warmth evaluations toward HP individuals on the whole. To some extent, the result also suggests that Confucianism and individuals' real experiences may both contribute to the formation of power stereotypes under Chinese background, however, those real experiences may carry more weight in power stereotype formation. From a special perspective, the key role of Confucianism in the MPMW effect actually reminds us that we should be extremely cautious in assessing the representativeness and generality of the MPMW effect. At least according to our results, the MPMW effect may only exist among HP stereotypes under Confucian culture, and this conclusion still needs to be further assessed by conducting cross-cultural research.

Implications for Power Stereotype Research

At first glance, our finding that senior HP individuals were perceived as warmer than junior HP individuals was at odds with the theoretical propositions of the SCM (Fiske et al., 2002; Cuddy et al., 2008). According to the SCM, individuals tend to form ambivalent stereotypes about out-group members—a positive evaluation on one dimension and a negative evaluation on the other. Moreover, the SCM posits that the elevation of competition and status often means more positive evaluation on the competence dimension but more negative evaluations on the warmth dimension. So, according to this proposition, senior HP individuals seemingly should be perceived as more negative on the warmth dimension compared to junior HP individuals. We proposed that this superficial contradiction could be accounted for by the term "reference group" of the SCM (Cuddy et al., 2008, 2009). Specifically, the SCM defines the reference groups as in-groups to which perceivers belong or societal prototype groups which theoretically serve as normative standards for social comparison or social aspiration (Cuddy et al., 2009). According to this definition, senior HP individuals could be classified into the latter case, because Study 2a revealed that the great majority of participants reported that they actually had little chance to get access to senior HP individuals and they may form impressions about senior HP individuals mainly based on the construction of Confucianism. In this sense, the MPMW effect on senior HP individuals actually reflects participants' expectation about HP individuals. In other words, senior HP individuals may be regarded as the reference group and the MPMW effect on them reflect the expectation of the whole Chinese society about how HP individuals should exert social power. Thus, our finding in essence is consistent with the propositions of the SCM.

On a broad level, the current research suggested that power stereotypes could serve to maintain the stability of social hierarchy, thus indicating the social function of power stereotypes (Ryan, 2002). As is well known, stereotypes function as a double-edged sword. On one hand, stereotypes can bias individuals' cognition and behavior, and even lead to particular kinds of discrimination and conflict in society (Bordalo et al., 2016). However, on the other hand, stereotypes also help us effectively navigate the social world. Specifically, on the individual level, the cognitive miser hypothesis postulates that in an environment that contains too much information, individuals apply specific stereotypes to simplify their information processing and enhance their processing efficiency (Brewer, 1988; Fiske and Neuberg, 1990). In addition to enhancing the efficiency of processing information, according to the "kernel of truth" hypothesis which contends that stereotypes may represent the over-amplified but the real existing differences between groups, stereotypes also provide a quick and intuitive assessment for us when confronting strangers or groups (Oakes et al., 1994). On the social level, some researchers have proposed that stereotypes to some extent reflect people's propensity to follow the social rules within a particular culture, and stereotypes can satisfy people's this need by serving to maintain the legitimacy and stability of social hierarchy (Tajfel, 1981; Leyens and Fiske, 1994). Supporting the view of the social function of stereotypes, our results suggest that possessing power stereotypes to some extent serves for maintaining the stability of social hierarchy. For example, when ordinary people realize that they have received unfair treatment from junior officials of the government (e.g., village head), they generally do not immediately take action against the government. Rather, they often choose to express their voices toward senior officials of the government (e.g., county head), which is called "applying for an audience with the higher authorities to appeal for help" in Chinese society. According to our results, the logic underlying this phenomenon may be that most ordinary people believe that those leaders with greater power can handle matters in line with the doctrines of Confucianism and treat them fairly and kindly. In this sense, the social function of power stereotypes is similar to the function of the system justification theory (SJT), which posits that people generally perceive the prevailing social system as fair and legitimate, and are willing to maintain or bolster the stability of the whole society (Jost and Banaji, 1994; Kay and Jost, 2003).

Limitations and Future Work

Several limitations still existed in the current research. Firstly, in Study 2a, we found that participants indicated slightly more positive evaluations on the warmth dimension for the LP target than for the senior HP target. Considering that our main concern was the comparison of the perceived warmth between senior and junior HP targets, we thus did not further compare the perceived warmth between senior HP and LP targets. Given that, we actually could not draw a definite conclusion about the warmth comparison between senior HP and LP stereotypes under Confucian culture. This issue deserves further investigation. Also in Study 2a, our additional analyses showed that compared to junior HP targets, participants displayed more positive perceptions of senior HP targets on the sociability sub-dimension rather than on the morality sub-dimension. On the hand, this finding provided additional support for our Confucian explanation. However, on the other hand, it also reminds us that dividing traits into competence and warmth dimensions may be an oversimplified classification, and in future research, a more subtle classification of the trait level will help us have a deeper understanding about the MPMW effect. Thirdly, in Study 3, we found that the implicit evaluations toward senior HP targets on the warmth dimension became less positive when participants were presented with negative exemplars about senior HP individuals, but it is still certain whether the exposure to positive exemplars also could improve the evaluations toward junior HP individuals. In daily life, as we have described, most people actually have a high likelihood to interact with junior HP individuals rather than senior HP individuals. So, improving the evaluations of junior HP individuals may carry important practical implications for the stability of social order (Magee and Galinsky, 2008), and we should make a confirmation about this issue. Finally, due to lacking an available scale to assess individuals' identification with Confucianism, we developed the Confucianism scale containing three items. Although the scale displayed good internal consistency reliability in the current research, its suitability under Confucian culture should be completely assessed in a larger sample. Additionally, considering that the current research was the first time to reveal the MPMW effect on senior and junior HP individuals, we should be cautious about the generalizability of the effect, and more work still needed to be done to solve this issue.

CONCLUSIONS

By employing the trait-rating task and the IAT task, the current research found that under Chinese culture, although participants tended to associate more power with less warmth when comparing HP individuals with LP individuals, they associated more power with more warmth when comparing senior HP with junior HP individuals (the MPMW effect). By measuring/manipulating the accessibility of Confucianism, the current research further specified that participants' identification with Confucianism was the premise for the existence of the MPMW effect. The present research for the first time demonstrates that the contents of power stereotypes may partially display culture-specific characteristics under Confucian culture. Additionally, the continuous perspective on power classification in our research provides a novel insight for future power research.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Taishan University. The patients/participants

provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FY designed the current research. ML wrote and revised the manuscript. YH collected the data involved in the research and conducted data analyses. All authors contributed to the article and approved the submitted version.

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Self-Stigma Among People With Mental Health Problems in Terms of Warmth and Competence

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Introduction: Self-stigma arising from public stigma is a heavy burden for people suffering from mental health problems. Both public stigma and self-stigma encompass the same three elements: stereotype, prejudice, and discrimination. Public stigma has already been successfully explored by the Stereotype Content Model (SCM) and the Behaviors from Intergroup Affect and Stereotypes (BIAS) map. However, this is not the case for self-stigma. Therefore, this is the first study that applies SCM and the BIAS map to self-stigma by examining whether the effects of self-stereotypes on self-directed discrimination would be mediated by self-directed prejudices in people with mental health problems.

Method: Within a total sample of $N = 823$ participants, who took part in an online survey, $n = 336$ people reported mental health problems. Mental health and self-stereotypes (warmth, competence), self-directed prejudice (negative emotions), and self-directed discrimination (active/passive self-harm) were assessed.

Results: Structural equation modeling supported the hypothesis that the stereotype dimensions warmth and competence negatively related to prejudice, while stronger prejudice was associated with more discrimination (active/passive self-harm). Prejudice fully mediated the relationship between stereotypes and discrimination. The indirect effects of warmth and competence on active and passive self-harm were moderated by competence and warmth.

Discussion: Implications for further research on self-stigma and the usage of SCM and BIAS map are discussed.

Keywords: self-stigma, stigma, stereotype content model, BIAS map, warmth, competence, mental health

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INTRODUCTION

Mental health problems are challenging our societies. It is estimated that, approximately, 165 million people suffer from mental disorders in Europe. This corresponds to 12-month prevalence of 38.2% (Wittchen et al., 2011) and causes costs of over EUR 600 billion (OECD, 2018). Those affected have to carry a double burden. They not only suffer from disease-specific symptoms, functional

disabilities (Buist-Bouwman et al., 2006; Mack et al., 2015), or decreased quality of life (Alonso et al., 2004a; Mack et al., 2015) but also public stigma (Rüsch et al., 2005). Public stigma is an additional pitfall because it is associated with self-stigma (Vogel et al., 2013). It is assumed that public stigma and, especially, self-stigma are barriers to help seeking behavior (Rüsch et al., 2005; Clement et al., 2015; Cheng et al., 2018; Schomerus et al., 2019). Since only 25.7% of those who met the criteria for a mental disorder in the past 12 months are using mental health services (Alonso et al., 2004b), a better understanding of the components of self-stigma and their interaction is needed to bridge the gap for better health care. Since the Stereotype Content Model (SCM, Fiske et al., 2002) and the Behaviors from Intergroup Affect and Stereotypes (BIAS) map (Cuddy et al., 2007) are well-established theories that were already successfully applied to public stigma, it seems obvious to apply them to self-stigma as well so that both—public stigma and self-stigma—can be integrated within the same theoretical framework. This is the first study to examine whether the SCM and the BIAS map can be applied to self-stigma.

Public Stigma

Public stigma is described as society's negative reaction toward people with mental illness (Corrigan and Watson, 2002a). People with mental illness are strongly affected by public stigma and experience even more stigma than people with physical disabilities (Kowalski and Peipert, 2019). Due to the high prevalence of mental illness stigma (Tzouvara et al., 2016), the consequences are far-reaching, for example, reduced use of mental health services (Schomerus et al., 2019), reduced mental health (Ilic et al., 2013), or dehumanization of people with mental illness (Boysen et al., 2020a,b). Based on the *social-cognitive model of public stigma* (Corrigan, 2000; Corrigan and Watson, 2002a), it is assumed that public stigma encompasses three elements: stereotypes, prejudice, and discrimination. Stereotypes are shared beliefs about groups, generalizing the characteristics of members and neglecting differences among them (Aronson et al., 2014). Common stereotypes about people with mental illness address dangerousness and reduced competence (Crisp et al., 2000; Parcesepe and Cabassa, 2013). Prejudices are negative emotional evaluations. Examples of prejudice against people with mental illness are fear, anger, and pity (Corrigan et al., 2003; Angermeyer et al., 2010). Discrimination as negative group-based behavior against people with mental illness includes withholding help (Corrigan, 2000), not hiring someone (Corrigan and Watson, 2002a; Tzouvara et al., 2016), rejection from potential mates (Boysen et al., 2019), and social distancing (Parcesepe and Cabassa, 2013). The elements of public stigma are linked since stereotypes are associated with prejudices, which are associated with discriminatory behavior (Corrigan and Watson, 2002a). Discrimination against people with mental illness varies with the valence and severity of stereotypes and prejudices (Corrigan and Watson, 2002a). Applying the Stereotype Content Model framework (Fiske et al., 2002; Cuddy et al., 2007), Sadler et al. (2015) showed, for example, that mental illness stereotypes correlated with specific emotional and behavioral action tendencies. The Stereotype Content Model is a universal model for group perception, which we applied for analyzing the self-stigma of people with mental health problems in the present study.

Stereotype Content Model and Behaviors From Intergroup Affect and Stereotypes Map

According to the Stereotype Content Model (SCM; Fiske et al., 2002; Fiske, 2018), stereotypes boil down to two fundamental dimensions: warmth (W) and competence (C). Warmth represents the intention of group members, ranging from competition [cold/low warmth (LW)] to cooperation [warm/high warmth (HW)]. Competence represents the ability of group members to achieve their goals, which is related to low [incompetent/low competence (LC)] or high status [competent/high competence (HC)]. Out of the interaction of warmth and competence arise four types of stereotype content: First, groups perceived as warm but incompetent (HW/LC), for example, older people (Durante et al., 2013) and people with physical disabilities (Meyer and Asbrock, 2018). They provoke mostly pity and sympathy. Second, groups perceived as competent but cold (LW/HC), for example, rich people (Durante et al., 2013; Meyer and Asbrock, 2018) or feminists (Fiske et al., 2002; Durante et al., 2013). They provoke envy and jealousy. Third, groups perceived as warm and competent (HW/HC), for example, in-group or middle-class (Fiske et al., 2002; Durante et al., 2013). They provoke admiration and pride. Fourth, groups perceived as cold and incompetent (LW/LC), for example, homeless people (Lee and Fiske, 2006), or people with mental illness (Sadler et al., 2012; Meyer and Asbrock, 2018; Boysen et al., 2020a). They provoke contempt, disgust, and anger. Within the group of people with mental illness, stereotype content varies between different disorders. Those with schizophrenia, multiple personality disorders, or addictions are, for example, perceived as especially low in warmth and competence (Fiske, 2012; Sadler et al., 2012). The SCM is a highly established model and has been proved to be stable across cultures and countries (Cuddy et al., 2009; Asbrock, 2010; Durante et al., 2013; Bye et al., 2014; Fiske, 2018), while there are also cultural variations, for example, depending on a society's extent of equality or individuality (Fiske and Durante, 2016). In addition, the SCM is applicable to different levels of social evaluation: intergroup, interpersonal, and individual levels (Cuddy et al., 2008; Russell and Fiske, 2008; Aragonés et al., 2015).

The Behaviors from Intergroup Affect and Stereotypes (BIAS) map (Cuddy et al., 2007) extends the SCM and differentiates four types of behavior tendencies based on perceived warmth, competence, and the associated emotions. Warmth predicts active behaviors: active facilitation (e.g., help, protect) toward others perceived as warm and active harm (e.g., fight, attack) toward those perceived as cold. Competence predicts passive behaviors: passive facilitation (e.g., cooperate with) toward others perceived as competent and passive harm (e.g., exclude, ignore) toward those perceived as incompetent. Emotions have particular importance within the BIAS map because they predict behavior tendencies more strongly and directly than warmth and competence: emotions mediate the relationship between

stereotypes and behaviors. Admiration (HW/HC) predicts active and passive facilitation, contempt (LW/LC) predicts active and passive harm, pity (HW/LC) predicts active facilitation and passive harm, and envy (LW/HC) predicts active harm and passive facilitation (Cuddy et al., 2007; Echebarria-Echabe, 2013; Key et al., 2019; Constantin and Cuadrado, 2020; Findor et al., 2020).

Stereotype Content Model, BIAS Map, and Public Stigma

The SCM and the BIAS map have been used to examine public stigma of people with mental illness (Sadler et al., 2015; Iles et al., 2016; Thonon et al., 2016; Boysen, 2017). This is due to the advantage of the SCM and the BIAS map to specify the prediction of specific stereotypes on specific emotions, and specific behavioral tendencies as well as their interactions. Meaning that perceived warmth and competence of people with mental illness is predicting emotional prejudice like contempt (Sadler et al., 2015; Iles et al., 2016), as well as discrimination like active and passive harm (Boysen, 2017). Sadler et al. (2015) examined public stigma for different subgroups of people with mental illness and found support for the mediating relationship of emotions between stereotypes and discriminatory behavior. Furthermore, they observed anger and fear as different emotions outside of contempt (LW/LC) because of their unique position in public stigma literature. This is due to the observation that stigmatized people are frequently confronted with someone's anger and fear (Corrigan et al., 2003; Angermeyer et al., 2010). Anger and fear are primarily predicted by warmth (Boysen, 2017) and, therefore, should lead to active behavior (Cuddy et al., 2007). Following this, Sadler et al. (2015) could show that anger mediated the relation between warmth and active harm. On the contrary, fear was predicted by both warmth and competence, with the result that fear mediates the association between both stereotype dimensions and passive harm (Sadler et al., 2015). In line with this, emotional prejudice, involving anger and fear besides contempt, occupies a central position within public stigma.

Self-Stigma

Self-stigma of mental illness is described as the internalization of negative stereotypes from a society that broadly endorses stigmatization (Corrigan and Watson, 2002a,b). Those stereotypes may address incompetence or dangerousness (Corrigan and Rao, 2012). Self-stigma is not only associated with public stigma (Vogel et al., 2013) but also encompasses the same three elements: stereotype, prejudice, and discrimination. However, the elements of self-stigma refer to oneself and not to others (Corrigan and Watson, 2002a). People with mental illness are aware of stereotypes that concern people like them (e.g., "*Mentally ill persons are incompetent.*"). If they agree to them and apply them to the self, harming cognitions ensue, and the process of internalization is completed (e.g., *"I'm incompetent and not worthy."*; (Corrigan et al., 2011; Corrigan and Rao, 2012). These stereotypes can result in self-prejudice, which is conceptualized as a negative affective reaction toward the self (Corrigan and Watson, 2002b), including emotions like fear (Corrigan and Rao, 2012) or shame (Kranke et al., 2010; Rüsch et al., 2010; Hasson-Ohayon et al., 2012; Tucker et al., 2013; Birtel et al., 2017). In addition to this, self-prejudice is also strongly related to low self-esteem, which, again, is associated with negative affective reactions like shame (Budiarto and Helmi, 2021), depression or anxiety (Sowislo and Orth, 2013). Negative affective reactions, in turn, can elicit discriminatory behaviors against the self (e.g., self-isolation Corrigan and Rao, 2012) or secrecy of the mental illness (Stolzenburg et al., 2017). Self-stigma is associated with several negative outcomes, such as decreased quality of life (Corrigan and Rao, 2012; Kao et al., 2016) and well-being (Kao et al., 2016; Rose et al., 2019), reduced help-seeking behavior (Evans-Lacko et al., 2012) or non-adherence to or drop-out from treatment (Corrigan et al., 2014), as well as increased symptom severity (Boyd et al., 2014), depressiveness (Kao et al., 2016), and suicidality (Oexle et al., 2018). Even though self-stigma and a negatively biased view of the self as a symptom of depression overlap at some point, it is important to distinguish them. First, self-stigma is prevalent among various mental disorders besides depression like schizophrenia spectrum disorder, other mood disorders, anxiety disorders, PTSD, borderline personality disorder, autism spectrum disorder, and eating disorders (Griffiths et al., 2015; Bonfils et al., 2018; Dubreucq et al., 2020). Second, not all individuals with depression experience self-stigma. Only one in five people with depression or bipolar disorder suffers from a moderate to a high level of self-stigma (Brohan et al., 2011). At last, self-stigma is, instead, an additional burden for those who suffer from depression and, therefore, should be addressed on its own when trying to improve shared negative outcomes like low self-esteem or avoidance (Corrigan et al., 2006; Manos et al., 2009; Shimotsu and Horikawa, 2016).

The Present Study

People with mental illness are confronted with a double burden: On the one hand, they suffer from disease-specific symptoms and functional disabilities (Buist-Bouwman et al., 2006; Mack et al., 2015). On the other hand, they experience public and self-stigma with negative consequences (Rüsch et al., 2005). While previous research applied the SCM (Fiske et al., 2002) and the BIAS map (Cuddy et al., 2007) to public stigma of people with mental illnesses (Sadler et al., 2015; Iles et al., 2016; Thonon et al., 2016; Boysen, 2017), to the best of our knowledge, self-stigma has not been analyzed in this theoretical context. These well-established models, however, are likely to provide a systematic framework for understanding the specific relations between self-stereotyping, self-prejudice, and self-directed discrimination. This assumption receives support from the *Dual Perspective Model of Agency and Communion* [DPM-AC (Abele and Wojciszke, 2014; Abele et al., 2021)]. It also refers to two fundamental dimensions similar to warmth and competence (communion and agency). It provides a broader empirical endorsement for the applicability of those two dimensions within an intraindividual context like self-stigma. However, it is still uncertain if SCM and the BIAS map are suitable to make predictions for self-stigma and whether the effects of stereotypes on discrimination are also mediated by prejudice within self-stigma. Thus, this study aimed to apply

the specific predictions of the SCM and the BIAS map to self-stigma among people with mental health problems. Since self-stigma as internalization of negative stereotypes includes harmful cognitive and emotional reactions toward the self, the resulting behavioral reactions typically have a negative valence (Corrigan, 2016). In terms of the SCM and the BIAS map, the internalization of negative stereotypes, respectively, harmful cognitions, is represented by low warmth and low competence. These predict contempt as an emotional reaction and active as well as passive harm as a behavioral reaction. Therefore, we focused our hypotheses on active and passive (self-) harming behavioral tendencies, meaning that they result in a negative outcome for the affected one (the self). (Self-)Prejudice in the context of self-stigma contains several negative emotional reactions (e.g., fear, shame), which are most likely allocated in the same cluster—low warmth/low competence—as contempt. It was expected that self-directed stereotypes (warmth, competence) of people with mental health problems predict self-prejudice (negative emotions), as well as discrimination (active and passive self-harm). Negative emotions were hypothesized to be associated with active and passive self-harming behavior and to mediate the relationship between warmth and active self-harm, as well as competence and passive self-harm. The interaction of warmth and competence was assumed to influence negative emotions as well as active and passive self-harm. Verifying the use of SCM and the BIAS map to explain self-stigma would allow a stronger theoretical link between public and self-stigma. Furthermore, the universal theoretical framework could help researchers explain self-stigma for all kinds of mental health problems, physical disease, and even for other reasons for self-stigma like sexual orientation. A better understanding of self-stigma could also help to shed more light on specific mechanisms, which may be essential to developing effective interventions to reduce self-stigma.

MATERIALS AND METHODS

Participants

Three-hundred and thirty-six predominant female (73.2%) individuals aged 18 to 62 (M = 26.79, SD = 9.44), with mental health problems (clinical subsample A), as well as 393 healthy individuals (healthy subsample B; 74.8% female, aged 18–76, M_{age} = 27.34, SD_{age} = 10.39) within a total sample of N = 823 participants (74.4% female, aged 18–76, M_{age} = 28.15, SD_{age} = 11.16), were recruited through University mailing lists, social media, as well as flyers at public places between November 2019 and June 2020. Individuals with mental health problems (A) reported to have mental health problems (n = 145), a diagnosed mental disorder (n = 98) or passed at least one cut-off score, which indicates a mental disorder within the German Patient Health Questionnaire (PHQ-D; n = 277). Healthy participants (B) reported to have neither mental nor physical health problems or disease and passed no cut-off score of the PHQ-D. Most of the participants were students (n = 543, 66.0%) or employed (n = 218, 26.5%). Participation was voluntary in return for course credit or the chance to win one of five gift cards (25€). The study was approved by the Local Ethics Committee. All the participants gave informed consent prior to participation. Detailed sociodemographic and clinical characteristics for individuals with mental health problems (A), as well as healthy participants (B), are presented in **Table 1**.

Materials

Mental Health

Mental health was measured with the German Patient Health Questionnaire (PHQ-D; Löwe et al., 2002). The PHQ-D is based on the criteria from the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM–IV; American Psychiatric Association, 2000). It was used as a screening instrument for five common mental disorders (the participants were included if they scored above the respective cut-off scores). The PHQ-D has 78 items and allows for provisional diagnosing somatoform (Cronbach's α = 0.79; Gräfe et al., 2004), depressive (Cronbach's α = 0.88; Gräfe et al., 2004), anxiety (Cronbach's α = 0.89; Löwe et al., 2008), eating and alcohol disorder within independent modules. Cut-off scores were used as defined in the PHQ-D instruction manual (Löwe et al., 2002).

Stereotype

The stereotype dimensions warmth and competence were measured with three items each on a seven-point Likert scale (0 = *not at all* to 6 = *completely*). These items are based on Fiske et al. (2002) and were adopted from Eckes (2002) and Asbrock (2010). The frame of reference of all items was changed so that they focus on the self (*I see myself as […]*). Warmth was assessed by *likable, warm, good-natured*; competence by *independent, competitive*, and *competent*[1]. In the present study, the internal consistencies (Cronbach's α) for warmth and competence were 0.71 and 0.79, respectively.

Prejudice

In the context of self-stigma, prejudice is defined as negative emotional reaction toward the self (Corrigan and Watson, 2002b). Four items (*contempt, anger, fear,* and *shame*[2]) from the low warmth/low competence cluster were used to measure the frequency of experiencing negative emotions. Contempt was derived directly from the SCM (Fiske et al., 2002). Anger, fear, and shame were added because they are relevant not only in the context of public stigma (Angermeyer et al., 2010; Sadler et al., 2015; Birtel et al., 2017) but also self-stigma (Corrigan and Rao, 2012; Tucker et al., 2013; Pérez-Ramírez et al., 2021). In addition, anger and fear were already used in the context of the SCM and the BIAS map and predicted harming behavior (Cuddy et al., 2007; Sadler et al., 2015). The phrasing of the items refers to Fiske et al. (2002) and Cuddy et al. (2007). Prejudice was measured with four items on a seven-point Likert scale (0 = *never to* 6 = *very often*). An example was given for every item (*contempt: I'm feeling contempt for myself*; *anger: I'm angry with myself*; *fear: I'm afraid of myself*; *shame: I'm ashamed of myself*). Cronbach's α was 0.83 in this study.

[1]German wording: sympathisch, warmherzig, gutmütig, eigenständig, konkurrenzfähig, kompetent.

[2]German wording: Verachtung, Wut, Angst, Scham.

TABLE 1 | Sociodemographic and clinical characteristics of the subsamples A ($n = 336$) and B ($n = 393$).

	A Individuals with mental health problems		B Healthy individuals	
Characteristic	***n* or Mean**	**% or *SD***	***n* or Mean**	**% or *SD***
Gender				
Male	83	(24.7)	92	(23.4)
Female	246	(73.2)	294	(74.8)
Diverse	4	(1.2)	2	(0.5)
Age	26.79	(9.44)	27.34	(10.39)
Highest educational level				
Middle school (10th grade)	16	(4.8)	9	(4.8)
High school	214	(63.7)	230	(63.7)
University or postgraduate degree	87	(25.9)	139	(25.9)
Others	17	(5.1)	8	(5.1)
Employment				
Unemployed	4	(1.2)	1	(1.2)
Employed	69	(21.1)	105	(21.1)
Student	241	(71.7)	262	(71.7)
Retired	2	(0.6)	2	(0.6)
Others	18	(6.4)	15	(6.4)
Self-reported diagnosis				
F1 (Abuse, Addictions)	3	(0.9)		
F2 (Schizophrenia)	2	(0.6)		
F3 (Affective disorders)	50	(14.9)		
F40, F41 (Anxiety disorders)	45	(13.4)		
F42 (Obsessive-compulsive disorders)	11	(3.3)		
F43 (PTSD)	19	(5.7)		
F45 (Somatoform disorders)	5	(1.5)		
F5 (Eating disorders)	27	(8.0)		
F6 (Personality disorders)	17	(5.1)		
Others	5	(1.5)		
PHQ-D: Clinical relevance				
Somatoform disorders	85	(25.3)		
Depressive disorders	92	(27.4)		
Anxiety disorders	83	(24.7)		
Eating disorders	23	(6.8)		
Alcohol disorders	137	(40.8)		

Discrimination

Discrimination as behavioral tendencies resulting in negative outcomes for the self was distinguished in active and passive self-harm. Both were measured with three items each on a seven-point Likert scale (0 = *not at all* to 6 = *completely*). Sixteen items were initially used for assessing active and passive self-harm. Observing all items with an exploratory factor analysis (EFA) with promax rotation indicated a three-factor solution. One factor could be interpreted as active self-harm [*I injure myself* (active_sh_1)[3], *I inflict bodily and mental pain on myself* (active_sh_2), *I intentionally harm my body* (active_sh_3)] and is comparable to the concept of non-suicidal self-injury (NSSI), describing the intended injury of body tissue without the purpose to die (Nock, 2010; Petermann and Nitkowski, 2011; Zetterqvist, 2015). The second factor was interpreted as passive self-harm (seven items: *I distance myself from friends and colleges, I avoid to disclose something about me, I refuse invitations and appointments, I reject offers of help, I don't make new contacts to avoid rejections, I keep problems to myself to not be a burden to someone, I avoid to focus on my thoughts, feelings, and needs*). While conceptualizing passive self-harm for this study, we focused on combining the concepts of indirect self-injury (St Germain and Hooley, 2012) and indirect self-destructiveness (Kelley et al., 1985), with the definition of passive harm on an intergroup level (Cuddy et al., 2007). Indirect self-injury and indirect self-destructiveness describe behavior that increases the probability of future negative consequences and includes avoiding or omitting action while excluding injuring body tissue (Kelley et al., 1985; St Germain and Hooley, 2012; Tsirigotis, 2018). Passive harm on an intergroup level means to reduce

[3] Abbreviations refer to **Figure 1**.

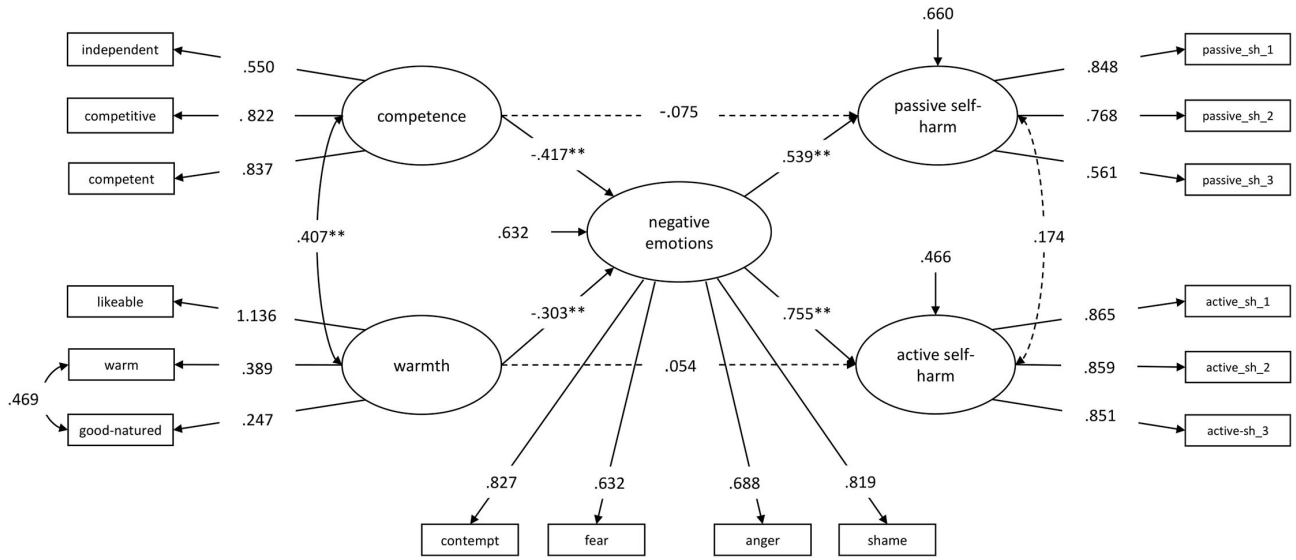

FIGURE 1 | Warmth and competence, predicting passive and active self-harm *via* negative emotions (Model 1.0). Standardized regression weights. Dashed lines are not significant ($p > 0.05$). * $p < 0.05$, ** $p < 0.01$. sh = self-harm.

TABLE 2 | Correlations between mean and standard deviation of all variables (subsample A, $n = 320$).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.00															
2	0.44**	1.00														
3	0.29**	0.52**	1.00													
4	0.22**	0.07	0.13*	1.00												
5	0.34**	0.08	0.06	0.47**	1.00											
6	0.44**	0.27**	0.20**	0.44**	0.69**	1.00										
7	−0.44**	−0.12*	−0.12*	−0.34**	−0.34**	−0.38**	1.00									
8	−0.35**	−0.05	−0.14*	−0.28**	−0.30**	−0.36**	0.56**	1.00								
9	−0.32**	−0.09	−0.05	−0.28**	−0.18**	−0.19**	0.49**	0.40**	1.00							
10	−0.44**	−0.11	−0.14*	−0.30**	−0.35**	−0.34**	0.68**	0.60**	0.55**	1.00						
11	−0.27**	−0.07	−0.11*	−0.24**	−0.33**	−0.33**	0.57**	0.40**	0.45**	0.44**	1.00					
12	−0.36**	−0.17**	−0.10	−0.29**	−0.34**	−0.33**	0.59**	0.45**	0.50**	0.51**	0.73**	1.00				
13	−0.29**	−0.11*	−0.13*	−0.23**	−0.25**	−0.24**	0.53**	0.35**	0.41**	0.41**	0.76**	0.72**	1.00			
14	−0.32**	−0.19**	−0.07	−0.25**	−0.26**	−0.23**	0.39**	0.34**	0.35**	0.42**	0.33**	0.42**	0.34**	1.00		
15	−0.29**	−0.21**	−0.10	−0.17**	−0.28**	−0.22**	0.31**	0.31**	0.26**	0.32**	0.31**	0.38**	0.35**	0.66**	1.00	
16	−0.23**	−0.19**	−0.06	−0.18**	−0.17**	−0.17**	0.27**	0.21**	0.25**	0.35**	0.29**	0.31**	0.27**	0.47**	0.43**	1.00
M	4.16	4.43	4.45	4.38	3.48	4.01	1.64	2.43	1.09	2.13	0.69	1.04	0.64	2.02	1.81	2.68
SD	1.27	1.14	1.13	1.21	1.53	1.33	1.67	1.65	1.50	1.80	1.39	1.57	1.32	1.79	1.71	1.87

1 = likeable, 2 = warm, 3 = good-natured, 4 = independent, 5 = competitive, 6 = competent, 7 = contempt, 8 = anger, 9 = fear, 10 = shame, 11 = active self-harm 1, 12 = active self-harm 2, 13 = active self-harm 3, 14 = passive self-harm 1, 15 = passive self-harm 2, 16 = passive self-harm 3, M = mean, SD = standard deviation, Pearson correlation coefficients, * $p < 0.05$ (two-tailed), ** $p < 0.01$ (two-tailed).

social worth by ignoring, neglecting, or excluding others so that social recognition is omitted (Cuddy et al., 2007). Transferring this to passive self-harm means that we ascertain self-directed behavior, which is characterized by avoiding or omitting actions that would lead to social recognition, for example, avoiding to join social activities, or excluding oneself from others. A second EFA with promax rotation was performed for passive self-harm to reduce the scale up to three items as well [*I distance myself from friends and colleges* (passive_sh_1), *I refuse invitations and appointments* (passive_sh_2), *I avoid to disclose something about me* (passive_sh_3)]. The third factor (8 items, e.g., *I keep telling myself that I'm worthless, I insult myself and swear at me, I tell myself that I'm incompetent*) was rejected because it did not meet the definition either of active nor passive self-harm. The internal

TABLE 3 | Correlations between latent variables (Model 1.0, subsample A, $n = 320$). And correct the variable names as follows "Active self-harm", "Passive self-harm".

		1	2	3	4	5
1	Warmth	1.00				
2	Competence	0.41**	1.00			
3	Negative emotions	−0.47**	−0.54**	1.00		
4	Activeself-harm	−0.30**	−0.39**	0.73**	1.00	
5	Passive self-harm	−0.29**	−0.37**	0.58**	0.52**	1.00

*Pearson correlation coefficients, ** $p < 0.01$ (two-tailed).*

consistencies (Cronbach's α) were 0.89 for active self-harm and 0.76 for passive self-harm.

Procedure

The participants took part in an online survey on "Healthy or ill: When do we help others and ourselves? An online survey on health-related self- and external perception"[4]. To reduce socially desirable responses, we refrained from using stigma-associated words in the title and the whole survey. After providing sociodemographic information, the participants were asked for their mental and physical health status, including the question if they suffer from mental health problems and diagnosed mental disorders. They were also asked for the kind of mental disorder they suffer the most from. Additionally, the participants were screened for mental disorders using the PHQ-D. All the participants responded to items, measuring warmth, competence, negative emotions, and active and passive self-harm. They also filled in other questionnaires (e.g., public stigma, health-related quality of life) that are not reported here. After finishing the questionnaire, the participants were thanked for their participation.

Statistical Analysis

Data preparation and descriptive statistics were performed using IBM SPSS statistics, Version 26. Missing data were examined for the total sample, which ranged from 0 to 0.6% per item. Little's MCAR test [$\chi^2(73) = 65.003$, $p = 0.735$] indicated that missing cases were completely missing at random. So, full information maximum likelihood (FIML) estimation was used to consider missing data. Items were screened for univariate (z-scores > 3.29) and multivariate outliers (mahalanobis distance, χ^2, $p < 0.001$), and 22 cases of the total sample were excluded, reducing it to $N = 801$. All statistical analyses concerning the clinical subsample A were performed with $n = 320$ participants and $n = 393$ participants for the healthy subsample B, respectively. Structural equation models (SEM) were conducted in Mplus Version 7 (Muthen and Muthen, 2012) using FIML estimator. Bootstrapping ($N = 5000$) was applied due to the non-normality of the data. A model was specified in which the stereotype dimensions warmth and competence predict the discriminatory dimensions of active and passive self-harm. Prejudice was complemented as a mediator, following the theoretical implications of the SCM and the BIAS map. Latent variables were defined for all constructs. Warmth and competence, as well as active and passive self-harm, were allowed to correlate. Model modification indices were used to improve the model fit. To evaluate the model fit χ^2, root mean square error of approximation (RMSEA), comparative fit index (CFI), Non-Normed Fit Index (TLI), and standardized root mean square residual (SRMR) were examined. RMSEA and SRMR values < 0.05 indicate good fit; values between 0.05 and 0.08 suggest a reasonable fit (Browne and Cudeck, 1993; Schreiber et al., 2006). A CFI likewise TLI value > 0.95 indicates a good fit; a value above 0.90 suggests acceptable fit (Hu and Bentler, 1999; Schreiber et al., 2006). Indirect effects were computed using bias-corrected bootstrap confidence intervals. Considering that different combinations of warmth and competence, mixed and consistent stereotypes, are associated with distinct emotional and behavioral reactions within the framework of the SCM and the BIAS map, we also examined how the interaction of warmth and competence affects prejudice and discrimination within self-stigma in a separate model. The previously described structural equation model was complemented by a latent interaction term of warmth and competence (warmth x competence) that predicted negative emotions, passive self-harm, and active self-harm. Conditional indirect effects were calculated. All variables were standardized. Besides, Akaike-Information-Criterion (AIC) and Bayesian-Information-Criterion (BIC), the log-likelihood values were compared. A log-likelihood ratio test was performed to contrast the latent interactive model with the initial model. A significant result of the log-likelihood ratio test would indicate a significant loss in the model fit of the initial model relative to the latent interactive model. Relatively lower values of AIC and BIC indicate better model fit.

Additional Analyses

Research has already shown that gender is an important attribute when evaluating others on the fundamental dimensions of warmth and competence within the SCM and the BIAS map. Thus, there are differences between genders regarding warmth and competence (Eckes, 2002; Fiske, 2010; Fiske and Durante, 2016). Considering this, gender could also be meaningful when it comes to self-evaluation and self-stigma. Additional analyses were performed to examine the potential influence of gender (1 = women, 2 = men) on self-stereotypes, self-prejudice, and self-discrimination. Because of the small number ($n = 4$) of individuals, who stated their gender as diverse, they were not included in the analyses. Another three individuals did not report gender. So, analyses were performed with $n = 313$ participants. Another structural equation model was conducted that included gender as a control variable. Therefore, gender as a manifest variable was assumed to impact all five latent variables (warmth, competence, negative emotions, active self-harm, passive self-harm). Because of the centrality of the assumed indirect effects, we also tested whether gender moderated the indirect effects of stereotypes on discrimination *via* prejudice. Independent t-tests were chosen because of their robustness testing for differences between women and men in warmth, competence, negative emotions, active self-harm, and passive self-harm.

[4]German wording: "Gesund oder krank? Wann helfen wir anderen und uns selbst? Online-Studie zur gesundheitsbezogenen Selbst- und Fremdwahrnehmung".

TABLE 4 | Differences between women ($n = 235$) and men ($n = 78$) on stereotypes, prejudice, and discrimination (subsample A, $n = 320$).

	Women		Men		*t*	*df*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*				
Warmth	4.35	0.93	4.38	0.91	−0.19	311.00	0.850	−0.025
Competence	3.85	1.09	4.30	1.13	−3.12	311.00	0.002	−0.409
Negative emotions	1.93	1.38	1.43	1.10	3.22	165.57	0.002	0.422
Active self-harm	0.93	1.38	0.33	0.84	4.56	219.57	<0.001	0.596
Passive self-harm	2.30	1.51	1.75	1.29	3.13	151.90	0.002	0.409

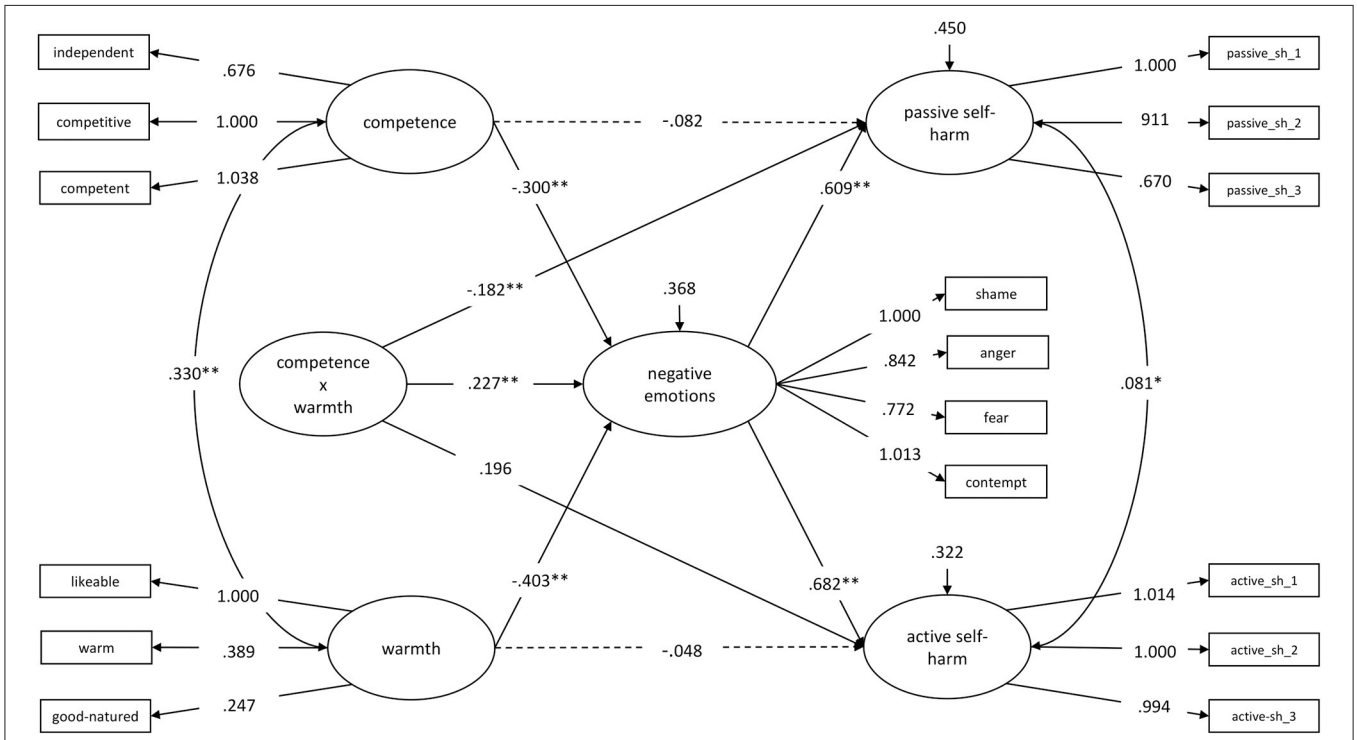

FIGURE 2 | Warmth, competence, and their interaction (warmth x competence), predicting passive and active self-harm *via* negative emotions (Model 2.0). Dashed lines are not significant ($p > 0.05$). * $p < 0.05$, ** $p < 0.01$. sh = self-harm.

To show the internalization process, which includes at first considering oneself as belonging to a stigmatized group (i.e., people with mental health problems), we compared the elements of self-stigma between different stages of belonging. These stages should indicate how likely it is that someone considers himself or herself as belonging to the group of people suffering from mental health problems. Five stages were defined: healthy individuals (stage 1, $n = 393$), individuals who passed only the cut-off for alcohol disorders, but did not state to have mental health problems (stage 2, $n = 93$), individuals who passed at least one cut-off for a mental disorder (but not for alcohol disorders) and did not state to have mental health problems (stage 3, $n = 89$), individuals who stated to have mental health problems, but no mental disorder (stage 4, $n = 46$), and individuals who stated to have a mental disorder (stage 5, $n = 92$). We assumed that, based on the relatively young sample that included many college students, those who passed only the cut-off for alcohol disorders but did not state to have mental health problems considered their drinking behavior as non-problematic and normative within a student environment. That implies they would not consider themselves as belonging to those suffering from mental health problems, meaning their self-view is unrelated to self-stigma. Because of this, we defined them as a separate group. One-way ANOVAs were conducted for stereotypes, prejudice, and discrimination, depending on the stage of belonging. Because of violations of assumptions, we used Welch's *F* for testing significance. *Post hoc* tests were performed with the Games–Howell procedure. We also calculated Pearson's correlations between the elements of self-stigma and the number of passed cut-offs of the PHQ-D as another indicator of belonging (subsample A, $n = 320$).

Taking the considerations mentioned above to individuals who passed only the cut-off for alcohol disorders but did not state to have mental health problems into account, we conducted our

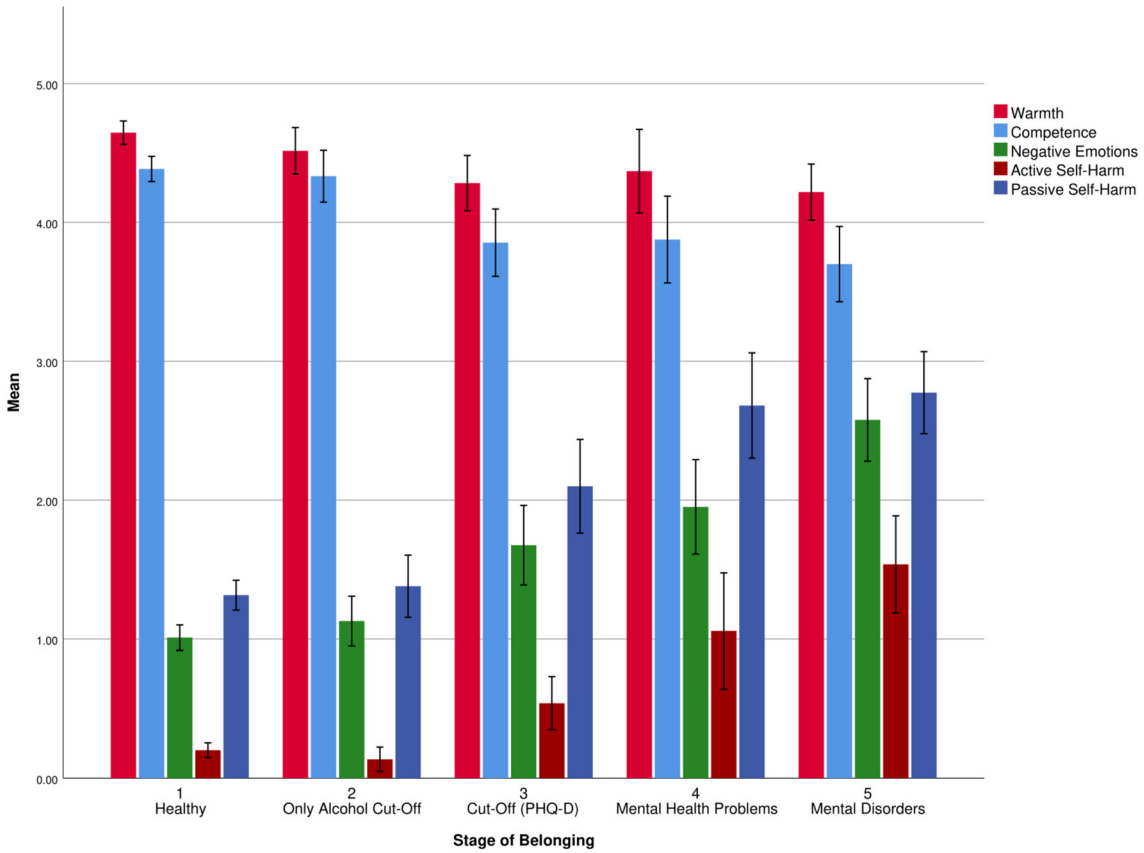

FIGURE 3 | Means and error bars (95% CI) of warmth, competence, negative emotions, active self-harm, and passive self-harm for each stage of belonging, referring to the process of internalization.

structural equation models again. This time, the models are based on a sample without those individuals, reducing the sample size to $n = 227$ individuals who suffer from mental health problems.

RESULTS

Descriptive Statistics and Intercorrelations

Table 2 shows descriptive statistics and bivariate correlations between all items. The intercorrelations of the latent variables are presented in **Table 3**. Means and standard deviations of stereotypes (warmth, competence), prejudice, and discrimination (active and passive self-harm) separated for women and men, and testing for differences between them, are shown in **Table 4**.

Hypothesis Testing

We tested our hypotheses regarding the interrelations of stereotypes, prejudice, and discrimination as parts of self-stigma in a structural equation model. The theoretically assumed model (Model 0) figured the latent constructs warmth and competence, including three items each as the manifest variables. Warmth predicted the latent construct active self-harm, competence predicted the latent construct passive self-harm. Active and passive self-harm included three items each as manifest variables. Warmth and competence were allowed to correlate as well as active and passive self-harm. The latent construct negative emotions (prejudice), including four items as manifest variables, were complemented as a mediator. So, warmth predicted active self-harm *via* negative emotions, and competence predicted passive self-harm *via* negative emotions. The manifest variables within the latent constructs were not allowed to correlate. The goodness-of-fit indices were not satisfying for the first model $\chi^2(96) = 255.644$, $p < 0.001$, $RMSEA = 0.072$ [90% CI = (0.061, 0.083), $CFI = 0.930$, $TLI = 0.913$, $SRMR = 0.055$, $AIC = 16{,}373.270$, $BIC = 16{,}584.296$]. Modification indices indicated a correlated residual between the items *warm* and *good-natured* within the latent construct warmth. So, we modified the model and allowed a correlation between these two items. As a result, the Goodness-of-fit indices improved and indicated good model fit $\chi^2(95) = 186.196$, $p < 0.001$; $RMSEA = 0.055$ [90% CI = (0.043, 0.066)]; $CFI = 0.960$, $TLI = 0.950$, $SRMR = 0.045$, $AIC = 12{,}002.207$, $BIC = 12{,}197.429$. **Figure 1** shows the standardized regression weights for the model (Model 1.0).

As expected, both warmth [$\beta = -0.303$, $B = -0.309$, $SE_B = 0.113$, 95% BCI = $(-0.543, -0.100)$, $p = 0.006$] and competence [$\beta = -0.417$, $B = -0.486$, $SE_B = 0.095$, 95%

BCI = (−0.682, −0.308), $p < 0.001$] were negatively related to negative emotions. However, warmth had no direct effect on active self-harm [$\beta = 0.054$, $B = 0.050$, $SE_B = 0.054$, 95% BCI = (−0.038, 0.180), $p = 0.348$], and competence was not directly related to passive self-harm [$\beta = -0.075$, $B = -0.090$, $SE_B = 0.112$, 95% BCI = (−0.298, 0.142), $p = 0.422$]. Negative emotions had a positive effect on both, active [$\beta = 0.755$, $B = 0.691$, $SE_B = 0.081$, 95% BCI = (0.538, 0.857), $p < 0.001$] and passive self-harm [$\beta = 0.539$, $B = 0.556$, $SE_B = 0.099$, 95% BCI = (0.367, 0.746), $p < 0.001$].

Indirect Effects

The theoretically assumed specific indirect effect of competence on passive self-harm *via* negative emotions emerged as significant [$\beta = -0.225$, $B = -0.270$, $SE_B = 0.075$, 95% BCI = (−0.445, −0.151), $p < 0.001$], as well as the indirect effect of warmth on active self-harm *via* negative emotions [$\beta = -0.228$, $B = -0.214$, $SE_B = 0.082$, 95% BCI = (−0.399, −0.074), $p = 0.009$]. Furthermore, to our assumptions, we also tested the specific indirect effects of competence on active self-harm *via* negative emotions [$\beta = -0.315$, $B = -0.336$, $SE_B = 0.077$, 95% BCI = (−0.506, −0.199), $p < 0.001$], as well as the effect from warmth on passive self-harm *via* negative emotions [$\beta = -0.163$, $B = -0.172$, $SE_B = 0.072$, 95% BCI = (−0.337, −0.056), $p = 0.016$]. Both were significant as well. Negative emotions fully mediated the relationships between the stereotype dimensions (warmth, competence) and discrimination (active self-harm, passive self-harm).

Latent Interaction of Warmth and Competence

Considering the different effects of mixed and consistent stereotypes, we defined another structural equation model with a latent interaction term of warmth x competence. Model 0 was the foundation for this. It was complemented by the interaction of warmth x competence, which predicted negative emotions, passive self-harm, and active self-harm. **Figure 2** shows the regression weights of Model 2.0. The relatively lower information criterions ($AIC = 12{,}417.358$, $BIC = 12{,}639.689$), and the result of the log-likelihood ratio test [$D_{(3)} = 3961.912$, $p < 0.001$] indicated better model fit for Model 2.0 compared to Model 0.

The conditional indirect effects of competence on passive self-harm *via* negative emotions emerged significant for those low in warmth [1 *SD* below M_{Warmth}; $B = -0.321$, $SE_B = 0.079$, 95% CI = (−0.476, −0.166), $p < 0.001$] and for those with medium-warmth levels [M_{Warmth}; $B = -0.183$, $SE_B = 0.052$, 95% CI = (−0.286, −0.080], $p < 0.001$], but not for those high in warmth {1 *SD* above M_{Warmth}; $B = -0.044$, $SE_B = 0.065$, 95% CI = [−0.173, 0.084], $p = 0.496$; s. (**Supplementary Figure 1**)}. The conditional indirect effect of warmth on active self-harm *via* negative emotions was significant for those low in competence [1 *SD* below $M_{\text{Competence}}$; $B = -0.430$, $SE_B = 0.088$, 95% CI = (−0.601, −0.258), $p < 0.001$] and for those with medium-competence levels [$M_{\text{Competence}}$ $B = -0.275$, $SE_B = 0.064$, 95% CI = (−0.399, −0.150), $p < 0.001$], but not for those high in competence [1 *SD* above $M_{\text{Competence}}$; $B = -0.120$, $SE_B = 0.076$, 95% CI = (−0.269, 0.029), $p = 0.116$; (**Supplementary Figure 2**)]. The effect from competence on negative emotions was significant for those low on warmth [1 *SD* below M_{W}; $B = -0.528$, $SE_B = 0.107$, 95% CI = (−0.737, −0.319), $p < 0.001$] and for those with medium warmth [M_{Warmth}; $B = -0.300$, $SE_B = 0.076$, 95% CI = (−0.450, −0.151), $p < 0.00$], but not for those high on warmth [1 *SD* above M_{W}; $B = -0.073$, $SE_B = 0.107$, 95% CI = (−0.283, 0.137), $p = 0.496$; (**Supplementary Figure 3**)]. Similar relations were found for the effect from warmth on negative emotions, depending on competence [low: $B = -0.630$, $SE_B = 0.115$, 95% CI = (−0.856, −0.404), $p < 0.001$; medium: $B = -0.403$, $SE_B = 0.083$, 95% CI = (− 0.565, −0.240), $p < 0.001$; high: $B = -0.175$, $SE_B = 0.108$, 95% CI = (−0.388, 0.037), $p = 0.106$; (**Supplementary Figure 4**)].

Additional Analyses

Considering gender differences, women perceived themselves less competent and experienced more negative emotions as well as active and passive self-harm compared to men (see **Table 4**). Referring to those differences, gender (1 = women, 2 = men) was then added as a control variable in Model 1.0, with impact on all five latent variables. Model fit declined ($\chi^2(107) = 258.113$, $p < 0.001$, $RMSEA = 0.067$ [90% CI = (0.057, 0.078), $CFI = 0.933$, $TLI = 0.915$, $SRMR = 0.082$], while gender had a significant impact on competence [$\beta = 0.215$, $B = 0.651$, $SE_B = 0.207$, 95% CI = (0.253, 1.057), $p = 0.002$], warmth [$\beta = 0.091$, $B = 0.454$, $SE_B = 0.173$, 95% CI = (0.118, 0.784), $p = 0.008$] and active self-harm [$\beta = -0.091$, $B = -0.275$, $SE_B = 0.109$, 95% CI = (−0.480, −0.053), $p = 0.011$]. A conditional indirect effect of gender was neither found for the effect from competence on passive self-harm *via* negative emotions nor for warmth on active self-harm *via* negative emotions.

Figure 3 shows means of warmth, competence, negative emotions, active self-harm, and passive self-harm for each stage of belonging to those suffering from mental health problems. We tested the internalization process and found significant differences between the different stages of belonging for warmth [$F(4, 173.214) = 5.811$, $p < 0.001$], competence [$F(4, 170.899) = 10.632$, $p < 0.001$], negative emotions [$F(4, 167.158) = 32.676$, $p < 0.001$], active self-harm [$F(4, 163.166) = 22.381$, $p < 0.001$], and passive self-harm [$F(4, 169.767) = 33.787$, $p < 0.001$]. Based on *post hoc* analyses, individuals who reported mental disease (Stage 5) perceived themselves less warm ($M_{\text{Diff}} = -0.42$, $p < 0.001$, 95% CI (−0.71, −0.12)] and less competent than healthy individuals [Stage 1; $M_{\text{Diff}} = -0.69$, $p < 0.001$, 95% CI (−1.08, −0.30)]. The same was found for those who passed at least one cut-off of the PHQ-D [Stage 3; warmth: $M_{\text{Diff}} = -0.35$, $p = 0.01$, 95% CI (−0.65, −0.06); competence: $M_{\text{Diff}} = -0.53$, $p < 0.001$, 95% CI (−0.88, −0.20)] compared to healthy ones. There was no significant difference of warmth and competence between Stage 3 and 5. Individuals, who reported mental disorders (Stage 5), perceived more negative emotions [$M_{\text{Diff}} = 0.90$, $p < 0.001$, 95% CI (0.33, 1.48)] and showed more active [$M_{\text{Diff}} = 1.03$, $p < 0.001$, 95% CI (0.66, 1.39)] and passive self-harm [$M_{\text{Diff}} = 0.66$, $p = 0.03$, 95% CI (0.04, 1.27)] than those who passed at least one cut-off of the PHQ-D without reporting mental health problems (Stage 3). The

number of passed cut-offs for mental disorders was significantly correlated with warmth {$r(318) = -0.20, p < 0.001$), competence [$r(318) = -0.32, p < 0.001$]}, negative emotions [$r(318) = 0.31$, $p < 0.001$], active self-harm [$r(318) = 0.36$, $p < 0.001$], and passive self-harm [$r(318) = 0.33, p < 0.001$].

Finally, we ran Model 1.0 and Model 2.0 once again without those participants, who only passed the cut-off for alcohol disorder of the PHQ-D but did not state to have mental health problems. Reducing the sample size to $n = 227$, Model 1.1 showed still good model fit ($\chi^2(95) = 143.850, p = 0.001$; *RMSEA* = 0.048 [90% CI = (0.031, 0.063)]; *CFI* = 0.969, *TLI* = 0.960, *SRMR* = 0.049, *AIC* = 12002.207, *BIC* = 12197.429. Model 2.1 (*AIC* = 8901.697, *BIC* = 9103.769) improved compared to Model 2.0.

DISCUSSION

This study aimed to apply the SCM (Fiske et al., 2002) and the BIAS map (Cuddy et al., 2007) to self-stigma among people with mental health problems by examining the effects of stereotypes (warmth, competence) on discrimination (active self-harm, passive self-harm) *via* prejudice (negative emotions). In line with the predictions of the SCM, it was found that both stereotype dimensions warmth and competence were negatively related to negative emotions. Low warmth, as well as low competence, was associated with more negative emotions, while these relations were even stronger when the other dimension was low, too. Furthermore, more negative emotions were associated with higher amounts of active and passive self-harm. Warmth and competence had no direct effect on active and passive self-harm. Negative emotions fully mediated the relationship between warmth and active self-harm as well as between competence and passive self-harm. Considering the interaction of the stereotype dimensions, the indirect negative effects of warmth and competence on active and passive self-harm *via* negative emotions were stronger when competence and warmth were low, respectively. Analyses also indicated indirect effects between warmth and passive self-harm plus competence and active self-harm. Based on the simultaneous observation of warmth and competence, it can be assumed that high values on one dimension protect against the negative impact of low values on the other dimension. These findings are consistent with the theoretical framework of the SCM (Fiske et al., 2002) and the BIAS map (Cuddy et al., 2007). Emotions affect behavior tendencies more strongly than stereotypes, emotions mediate the link between stereotypes and behavior tendencies and mixed and consistent stereotypes predict distinct emotional and behavioral reaction. Additionally, gender seems to impact self-stigma inasmuch as men see themselves more competent and experience less active self-harm than women. Considering oneself to belong to a stigmatized group is an important condition when self-stigma is internalized.

Why We Should Use the SCM and the BIAS Map Framework to Examine Self-Stigma

Previous research has already explored single elements of self-stigma: Typical stereotypes about the self, for example, incompetence and dangerousness (Corrigan et al., 2011; Corrigan and Rao, 2012), are related to emotions like fear and shame, which are conceptualized as prejudice (Rüsch et al., 2010; Corrigan and Rao, 2012; Hasson-Ohayon et al., 2012), while discrimination is featured by self-isolation (Corrigan and Rao, 2012). However, these stigma components were often examined separately or were operationalized differently based on various theoretical backgrounds, even though they try to describe elements influencing each other within self-stigma. Our study addressed these limitations by encompassing all three elements of self-stigma within one theoretical framework. The SCM and the BIAS map are well established and empirically confirmed (Fiske and Durante, 2016; Fiske, 2018). In comparison to previous theoretical approaches, they have the advantages of making more systematical predictions and strengthening the relationship between the stereotype dimensions warmth and competence, emotions, and discrimination within one theoretical framework. Using the SCM and the BIAS map to examine self-stigma seems appropriate because these models contain the same three elements as self-stigma: stereotypes, prejudice, and discrimination. By applying the SCM and the BIAS map to self-stigma, we were able to observe the single components of self-stigma as such and examine the relationships between all the components. By doing that, we could demonstrate that the predictions from the SCM and the BIAS map are appropriate within the concept of self-stigma. Overall, warmth and competence within the SCM and the BIAS map framework seem to be suitable to analyze both—public and self-stigma of mental illness. The applicability to public stigma has already been shown (Sadler et al., 2015; Boysen, 2017). So, it seemed deducible to transfer these findings on public stigma to self-stigma, because both share fundamental contents: Since, within both concepts, stereotypes relate to incompetence or dangerousness in terms of poor warmth (Parcesepe and Cabassa, 2013), prejudice to fear, anger, or pity (Corrigan et al., 2003; Angermeyer et al., 2010), and discrimination to social distancing or withholding help (Corrigan, 2000; Parcesepe and Cabassa, 2013).

Clinical Implications

The SCM and the BIAS map framework allows, based on the characteristics of warmth and competence, to make more specific predictions about a person's likely behavioral reaction. For example, a person who perceives himself or herself as highly incompetent and moderately warm is more likely to show passive self-harming behavior than active self-harming behavior. And a behavioral reaction will be even stronger by simultaneous high activation of emotions like contempt or shame. Moreover, a greater extent of one stereotype dimension seems to protect against increased negative emotions or self-harming caused by a low extent of the other stereotype dimension. This could be relevant for risk prediction or planning effective clinical interventions. A further advantage is the fundamentality of warmth and competence (Fiske et al., 2002) because it seems promising to integrate findings from related theories like attribution theory (Corrigan et al., 2003) or intergroup contact (Kotzur et al., 2019) so that they can be applied to self-stigma as well. The SCM and the BIAS map seem to be suitable for describing self-stigma among individuals with mental health

problems and allowing us to deepen our knowledge of the specific interactions between the elements of self-stigma. A better understanding of self-stigma based on well-established and empirically confirmed theories (such as the SCM and the BIAS map) may help elucidate critical mechanisms. Shedding more light on these mechanisms by experimental manipulation or longitudinal studies may help develop powerful self-stigma interventions, aiming to increase the quality of life and help-seeking behavior and reduce depressiveness, suicidality, and self-harm. Self-stigma, including self-harm, is prevalent among various mental disorders (Griffiths et al., 2015; Bonfils et al., 2018; Dubreucq et al., 2020). As a result, self-harm could be a relevant psychopathology in the wake of self-stigma, even for mental disease whose diagnostic criteria do not include self-harm as a symptom (which may be a reason why self-harm is often overlooked). A deeper understanding of self-stigma would allow to identify those patients and treat them with targeted interventions. Furthermore, it is reasonable to conjecture that self-harm resulting from self-stigma has to be treated differently than self-harm in consequence of emotional dysregulation or dissociation.

Limitations and Future Research

The current research used the same items to measure the stereotype dimensions warmth and competence as it is common practice in the SCM intergroup or interindividual research. However, the items measuring warmth did not indicate high loadings on the same factor. Instead, the strong relationship between the items *warm* and *good-natured* makes it conceivable that warmth, when referring to the self, may be better described by two facets: sociability and morality (Brambilla and Leach, 2014). Morality refers to perceived correctness, while sociability concerns cooperation and forming connections (Leach et al., 2007; Brambilla et al., 2011). At the group level, morality seems more critical than sociability (Leach et al., 2007; Brambilla et al., 2011, 2019), but, maybe, morality loses its dominance when it comes to the self-perspective (Brambilla and Leach, 2014). That would imply that it is more important for an individual to perceive oneself as being able to cooperate and form connections with others than acting morally. Future research should consider this by using items that represent both—sociability and morality. This may help to examine which component is more important for the self. While transferring assumptions from the intergroup and interindividual perspective to the self-perspective, the values of warmth and competence should be considered as well. Abele and Wojciszke (2014) refer to communal and agentic content as fundamental dimensions in their *Dual Perspective Model* (DPM-AC), which are similar to warmth and competence as fundamental dimensions in the SCM (Fiske et al., 2002) and the BIAS map (Cuddy et al., 2007). They could show that communion (warmth) and agency (competence) differ in their values, depending on the perspective. That means that agency is more important in the self-perception (intraindividual context) while communion is more meaningful in the other perception (intergroup/interindividual context; Abele et al., 2021). So, the question arises whether competence is more important than warmth regarding self-stigma. Our findings were not able to answer this question. The interaction of warmth and competence seems to play an important role while making specific predictions for emotional and behavioral reactions. Thus, it is also conceivable that the distinction between warmth and competence is not important for self-stigma-affected people. While internalizing negative stereotypes from society, the other perspective is addressed and warmth is given more weight. Simultaneously, the self is evaluated on focuses of competence. In the end, the values of warmth and competence compensate for each other and are of equal importance. This could explain why self-stigma is resulting not only in one type of self-harming behavior. Future research should pursue the question whether one stereotype dimension is more important than the other or whether the relation between both dimensions is crucial while predicting self-harm. This is highly relevant concerning the severity of self-harming behavior. Individual differences like gender or personality traits are further issues that future research on self-stigma should address. Our findings that men perceive themselves as more competent than women go along with research on the SCM, demonstrating that typical men are seen as highly competent and typical women as low competent (Eckes, 2002; Fiske, 2010). In line with this, our findings suggest that men, overall, experience less self-stigma. However, especially because men are seen as highly competent, some research suggests that this is why they are experiencing even more self-stigma (Latalova et al., 2014). Other research showed that women are suffering more from self-stigma, and, still, others found no gender difference (Evans-Lacko et al., 2012; Shimotsu and Horikawa, 2016; Kalisova et al., 2018; Mackenzie et al., 2019). So, current evidence of gender and self-stigma remains unclear. A pretty similar picture can be drawn for the relationship between personality traits and self-stigma. While some research indicated evidence for the association between certain personality traits [e.g., avoidant traits, self-directedness (Ociskova et al., 2015; Dubreucq et al., 2021) and self-stigma, others did not (Ingram et al., 2016)]. Thus, this seems to be an important issue with mixed evidence that also needs further research. By taking the cross-sectional study design into account, the observed relationships between stereotypes, prejudice, and discrimination or, more precisely, the indirect effects of warmth and competence on active and passive self-harm *via* negative emotions are only based on theoretical assumptions. In other words, we were not able to test causality. Nevertheless, experimental research supports the generic assumption that emotions mediate the relation between stereotypes and discrimination like it is predicted by the SCM and the BIAS map (Caprariello et al., 2009; Echebarria-Echabe, 2013; Kotzur et al., 2019; Sevillano and Fiske, 2019). Based on this, it seems promising to approve the cross-sectional relations in an experimental paradigm applied to self-stigma as well. In view of the key position of emotions in the self-stigma process, our findings are well integrable. We found that negative emotions (prejudice) mediate the relationship between the stereotype dimensions (warmth, competence) and discriminating behavior (active/passive self-harm). Here, prejudice includes different emotions (*contempt*, *shame*, *anger*, *fear*) from the low competence/low warmth cluster. The high internal consistency (Cronbach's $\alpha = 0.83$), as well

as the high loadings on the latent factor *negative emotions*, supports the assumption that these four items form one cluster so that it is adequate to conflate them. However, future research should consider these emotions separately as well. This would allow to observe which emotion out of the low competence/low warmth cluster enhances self-harming behavior the most. This could be helpful when thinking about specific interventions to reduce self-stigma. All participants completed the survey in the same order. Completing measures related to one's mental health may have primed the negative perceptions of mental health challenges and led to higher intercorrelations of the stereotype, emotion, and behavior measures. This should be kept in mind when interpreting the results. Mental health status was assessed by self-report using a screening instrument. Diagnoses have not been confirmed by professionals, making it difficult to compare the results to other research addressing people with mental illness or even inpatients. At the same time, it can be assumed that self-stigma would be more pronounced in a population of people with severe mental illnesses, resulting in lower scores of warmth and competence as well as stronger prejudice and self-harming behavior; thus, self-stigma would be even more relevant. Furthermore, the sample included people with different diagnoses, forming a heterogenous group, which allows only generic conclusions. Future research should target specific diagnoses and make sure that all participants have a confirmed diagnosis. Thus, it would be more clear which patients suffer from self-stigma to what extent.

CONCLUSION

This is the first study using the SCM and the BIAS map to describe self-stigma among people with mental health problems. In line with the theoretical assumptions, results indicated that the stereotype dimensions competence and warmth were associated with prejudice (negative emotions), which resulted in passive and active self-harm, while prejudice (negative emotions) fully mediated the relationship between stereotypes and discrimination. This is the first indication for the appropriate application of the SCM and the BIAS map to self-stigma and their suitability to explain public stigma and self-stigma among people with mental health problems. A more detailed understanding of the self-stigma of mental illness based on the specific and accurate predictions from the SCM and the BIAS map could be highly relevant in clinical practice and hopefully helps to reduce the negative outcomes of self-stigma, for example, suicidality (Oexle et al., 2018), non-adherence or dropout from treatment (Corrigan et al., 2014). Future studies should experimentally manipulate single elements of self-stigma or conduct longitudinal studies to further test the assumptions of the SCM and the BIAS map in self-stigma. However, more research is needed to shed more light on all of this.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Local Ethics Committee, Department of Psychology at Philipps University of Marburg. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LG and SS contributed to the conception and design of the study. LG collected the data and wrote the first draft of the manuscript. LG, FA, FE, and SS analyzed the data and interpreted the results. All authors contributed to manuscript revision, read, and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.877491/full#supplementary-material

Supplementary Figure 1 | Indirect effect of competence on passive self-harm *via* negative emotions moderated by warmth. *M* = Mean.

Supplementary Figure 2 | Indirect effect of warmth on active self-harm *via* negative emotions moderated by competence. *M* = mean.

Supplementary Figure 3 | Effect of competence on negative emotions moderated by warmth. *M* = mean.

Supplementary Figure 4 | Effect of warmth on negative emotions moderated by competence. *M* = Mean.

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Out of sight out of mind: Psychological distance and opinion about the age of penal majority

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The growth of urban violence in Brazil, as in other countries, has led citizens to demand more severe and punitive measures to solve the problem of juvenile crime. One motion submitted to the Brazilian parliament, for instance, proposes to reduce the age of penal majority (APM) from 18 to 16 years. Our hypothesis is that popular opinions about this proposal are largely constrained by construal levels and psychological distance. Accordingly, we expect that the knowledge and proximity to the circumstances associated with juvenile transgression will influence opinions about the proposal. To test this hypothesis, we evaluated how opinion against or for the proposal can be explained by psychological distance and moral development theory. We studied two samples, composed of people who do not have a deep experience with the subject (passersby in a public square (N = 77) and workers from a juvenile justice court (N = 157). After collecting socio-demographic information from the subjects and their answer to moral dilemmas, the data was subjected to a multivariate analysis by multimodal logistic regression for socio-demographic characteristics, Kohlberg moral stages, and opinion on the reduction of APM (agree, indifferent, and disagree) as dependent variables. Our findings suggest that 1) opinion about the APM depends on psychological distance and 2) socioeconomic variables may influence the average construal level of adolescent transgressors in the public's perspective.

KEYWORDS

psychological distance, moral development, public opinion, youth justice, adolescence

Introduction

The understanding of adolescence as a distinct phase of development interposed between the more recognizable stages of childhood and adulthood has been a dilemma to many cultures throughout the ages (Sawyer et al., 2018). In primitive societies, signs of puberty triggered "rites of passage" marking the transition for children into adulthood (Alcorta and Sosis, 2020). In those early hunter-gatherer groups and subsequent human generations, there was increased expectation that adolescents quickly obtained adult-level subsistence skills and contributed more effectively to their communities. Therefore, there was a great effort from the group's elders to teach children complex skills, such as hunting, manufacturing tools, and preparing food (Lew-Levy et al., 2017).

External signs of puberty are initiated by the activation of the neuroendocrine hypothalamic–pituitary–gonadal axis that induces robust increases in gonadotropins, which, by their turn, stimulate the gonads, ovary and testis, to develop and produce the sex steroids estrogens and androgens, respectively, and trigger the development of secondary sex characteristics (Delemarre et al., 2008). However, the dynamics between the socio-cultural perception of the outward signs of puberty and adolescent behavior are not perfectly juxtaposed (Worthman and Trang, 2018). For instance, while society expects adolescents to quickly demonstrate adult-like attitudes the most characteristic signs of this phase of development is an increase of risky behavior and low resistance to peer influence (Albert et al., 2013; Casey et al., 2020). As a result of this developmental constraint, adolescents, when compared to other age groups, are more likely to engage in transgressive experiments with addictive substances, violent and non-violent crime, and careless driving (Zimring, 2000), thus increasing their chances of conflict with the law. In western populations, the prevalence of criminal behavior increases from late childhood, peak during adolescence and then declines in adulthood, forming a bell-shaped age–crime curve (Moffitt, 2018). However, most violent crimes, such as homicides, are more frequently committed by adults. For instance, in the United States in 2020, more than 92% of murders were committed by individuals older than 18 (FBI, 2020).

As in childhood, optimal development in adolescence is predicated on a synergy between biology and socio-cultural context. Brain development, specifically, is characterized by the existence of distinct critical periods of plasticity during which the maturation of cortical circuits is more susceptible to environmental influence (Hensch, 2005). During adolescence, the most important brain region still in the process of maturation is the prefrontal cortex (PFC) (Paus et al., 1999), which is responsible for higher cognitive functions, including decision-making and emotional control. Also, during adolescence, adult-like connections between the PFC and the amygdala, an important region associated with signaling emotionally or motivationally relevant stimuli to the brain, begin to emerge (Tottenham and Gabard-Durnam, 2017). The association between the immaturity of key cortical areas and pathways associated with decision-making and emotional control and the search for freedom from parental supervision and affiliation to social circles probably underlies the characteristic impulsiveness and rebelliousness of adolescent behavior and is considered part of normal brain maturation (Carlisi et al., 2020). However, negative stereotypes are rife in the adult perceptions of adolescents' behavior. Even before Hall (1904) characterized the adolescent period as "storm and stress," youth behavior, associated with impulsiveness and emotional immaturity, has been viewed with reservation by many adults (Altikulaç et al., 2019). Previous works showed that this view is prevalent among both parents and teachers (Buchanan et al., 1990; Hines and Paulson, 2006). Gross and Hardin (2007) showed that stereotypes of adolescents influence explicit evaluations unconsciously and unintentionally.

Modern life has been associated with an increase in the span of the adolescence phase, both through the acceleration of puberty's arrival (Eckert-Lind et al., 2020) and a rise in the sociocultural thresholds for attaining adulthood (Hochberg and Konner, 2020). Nowadays, adolescence occupies a greater extent of human life course than in earlier periods (Patton and Viner, 2007). Consequently, there is a growing need for an expanded and more inclusive definition of adolescence in both law and social policies. However, society has been slow to catch up on these scientific findings and promote the updating and the appropriate framing of adolescent-related laws. Some initiatives, though, have been implemented and deserve mention, such as the creation in 2015 of a Young Adult Court (YAC) in San Francisco for eligible young adults, ages 18–24, and which proposes to align opportunities for accountability and transformation with the unique needs and developmental stage of this age group (Stamm, 2017).

Penal populism refers to an understanding of justice in which criminal and anti-social or deviant activity should be harshly punished (Pratt, 2007). This doctrine has been very popular due to the recent wave of populist leaders coming to power in many countries (Kenny and Holmes, 2020). One of the key proposals of penal populism is to decrease the age of penal majority (APM) in countries with penal codes they think are "extremely lenient" with juvenile transgressors. The present study was conducted in Brazil, where there are several proposals being discussed in congress to amend the constitution and decrease the APR from 18 to 16 y.o. (Vavassori and Toneli, 2015). First, we will present the problem of adolescent transgression in Brazil and then we will frame our experimental approach which was based on construal level theory and Kohlberg's theory of moral development.

Adolescent transgressions

The rapid growth of urban youth violence has increased popular demand for more severe and punitive measures against transgressors. In Brazil, a country with extreme levels of income inequality, the number of adolescents sentenced to socio-educational measures increased about 100% in 1 year, from 96,000 in 2018 to 189,000 in 2019. The discussion of punishment for youth transgression, however, is usually framed by the mistaken perception of adolescents as the main cause of violence rather than as victims, and that existing laws excessively protect juvenile offenders (Brondani and Arpini, 2021). As a result, Brazilian legislators proposed an amendment to the constitution to lower the APM from 18 to 16 years (Vavassori and Toneli, 2015; Petry and Nascimento, 2016). The amendment is currently under consideration in the Senate's Constitution, Justice, and Citizenship Committee. It specifically proposes the modification of art. 228 of the Federal Constitution so that criminal responsibility moves from 18 to 16 years for general crimes, and from 18 to 14 years for heinous crimes, torture, narcotics' trafficking, terrorism, and membership in a criminal organization. The most recent national poll from 2019 showed that 84% of the population approve the measure and this level has remained constant over the years since 2013 when it was first proposed (G1, 2019).

Since most juvenile criminal defendants in Brazil come from the lowest socioeconomic echelons of society, this measure would probably combine with a life history marked by neglect and precarious living conditions to trap them in an endless circle of poverty and recidivism (Petry and Nascimento, 2016; Brondani and Arpini, 2021). If the measure is eventually approved, adolescent transgressors could end up being incarcerated in adult penal facilities, which in Brazil are notorious for violence and bad living conditions in general (Constantino et al., 2016; Butler et al., 2018), in the middle of circuit building between the PFC and the amygdala in their brains (Tottenham and Gabard-Durnam, 2017). Recent experimental work from our group has already demonstrated that exposure to chronic stress and impoverished environments can compromise the development of the PFC in adolescent rats (Folha et al., 2017). This finding suggests that the same could occur in humans and the exposure of youth transgressors to the harsh environment conditions of adult prisons holds the risk of stunting their PFC development and compromising their chances of rehabilitation (Casey et al., 2010). While this can be considered a tragic outcome individually, it would be also costly to society in terms of waste of human capital.

Construal level theory

Social expectations and opinions about adolescence are variable and contingent upon culture. However, there is a widespread tendency to hold negative stereotypes against adolescents, both explicitly and implicitly (Gross and Hardin, 2007). According to Construal Level Theory (CLT), mental representations of persons are based on a continuum from personalized, or concrete, to more abstract, category-based representations, depending on the psychological distance of the perceiver (Trope and Liberman, 2010). We tend to think in concrete ways about entities and events which are spatially, temporally, emotionally, or socially close to us, and in abstract ways about entities and events perceived as distant according to the same parameters (Trope and Liberman, 2010). According to CLT, when judging other people's behavior, we are more readily inclined to apply our moral principles to psychologically distant than proximate targets (Eyal et al., 2008; Mentovich et al., 2016). An increase in psychological distance minimizes sensitivity to intrinsic characteristics of the targets while focusing on more diffuse factors such as gender, ethnicity, and social class (Mentovich et al., 2016; Yudkin et al., 2016). Thus, greater psychological distance makes us more vulnerable to stereotypes and other cognitive biases.

Stereotyping can lead to systematic misperceptions or misjudgments of reality based on preconceived beliefs, rather than relevant facts and actual enquiry. Commonly held stereotypes about adolescents can thus get in the way of a more reasonable understanding of their actual vulnerability and neglect by society. Unfortunately, the cognitive heuristics underlying such stereotypes are deeply ingrained in the human mind. However, some studies have suggested they can be modified by interventions aimed at changing the degree of abstract and concrete construal mindsets (McCrea et al., 2012).

Moral development

Humans are distinct from other animals for their deep concern over issues of morality, justice, and fairness (Decety and Cowell, 2018). We are also unique in establishing organizations and institutions to enforce social norms and assign appropriate punishments to violators (Buckholtz and Marois, 2012). Legal systems evolved from the need to organize life in complex human groups and were initially systematized from primitive moral codes.

Human morality arose as a set of skills and motives for cooperating with others and thus promote group welfare (Tomasello and Vaish, 2013). The roots of human morality can be glimpsed in cooperative behaviors seen in many non-human primate groups. Though, different from them, our expectations of what others should do are also guided by shared norms, not only statistical inference. Human morality develops through increasingly complex cognitive rationales for making moral judgments and decisions.

Kohlberg proposed that the development of human morality proceeds through Pre-conventional (stages 1 and 2),

Conventional (stages 3 and 4), and Post-Conventional (stages 5 and 6) levels of reasoning, with each of these levels being composed of two stages, thus making a total of six stages (Kohlberg, 1958, 1981, 1984; Turiel, 1966; Rest et al., 1969; Lapsley, 1992). According to Kohlberg, most children have a pre-conventional morality, most adults have a conventional one, and only 20 to 25% of the adult population attains the post-conventional level (Kohlberg, 1974). Kohlberg stages of moral reasoning can be ascertained from the response to moral dilemmas or fictional short stories that describe situations in which a participant must make a moral decision. The participant is asked a systematic series of open-ended questions, like what they think the right course of action is, as well as justifications as to why certain actions are right or wrong.

The present study

Since previous results have suggested that psychological distance is associated with differentiated sensitivity to the principles of justice (Engelmann et al., 2018), we hypothesize that the popular appeal of the proposal to decrease the APM in Brazil can be understood under the same framework. Thus, in the present work, we aim to verify whether the access to the reality of the youth judicial system, as a proxy to psychological distance, has a greater impact on the opinion on the reduction of the ACM. We also attempted to verify whether there is a distinct profile, in terms of both sociodemographic and moral development variables associated with being either in favor or opposed to reduction of the ACM.

Materials and methods

Participants

The research was approved by the Ethics and Research Committee with Humans of the Federal University of Para (UFPA) (approval #2.150.425). A total of 234 adult subjects participated in the study (77 in location 1 and 157 in location 2). **Table 1** shows the sociodemographic characteristics of participants in both locations.

Instruments

Subjects answered a sociodemographic questionnaire composed of 14 questions (gender, age group, marital status, religion, race, level of slums, occupation, level of education, family income, and family structure). The subjects also responded to three questions: "Have you heard about the proposal for decreasing the age of penal majority?" (YES/NO), "Do you agree with the proposal for decreasing the age of penal majority?" (AGREE, INDIFFERENT, DISAGREE), "Have you ever been the victim of juvenile crime?" (YES/NO).

The level of moral competence of subjects was assessed with a moral dilemma featuring adolescents in conflict with the law and based on the Moral Competence Test (MCT) designed by Lind (2000) according to Kohlberg's theory of moral development (Kohlberg, 1974; Mathes, 2019). The moral dilemma was based on a short story about the occurrence of several cell phone thefts committed by an underage teenager and about the possibility, or not, of arresting him after the store owner tampered with the date of the footage and handed it over to the police. Right after reading the dilemma, the participant was instructed to respond with his opinion on the store owner's decision. Responses were obtained in a Likert format from −3 to + 3, ranging from strong disagreement to strong agreement. Then, in the same vein, 12 arguments, six of which were favorable and six against the protagonist's action, were also answered, in a Likert format (−4 to + 4), ranging from strong disagreement to strong agreement.

Experimental procedure

Data were collected in two public places in the city of Belem (PA) through individualized interviews: a public square located at the center of Belem (PA) (Batista Campos Square, Location 1), and the Juvenile Court of Justice (Location 2). The choice of Location 1 is justified by the fact that it is a place where there is a large circulation of people with different economic and demographic profiles. Subjects in Location 2 (1st, 2nd and 3rd Courts of Childhood and Youth of the city of Belém), on the other hand, are judges, lawyers, psychologists, and social workers who interact with juvenile transgressors and their families in their daily routine.

Participants were selected by convenience at both locations. At location 1, the interviews took place on weekends and were conducted in the open air. At Location 2, the interviews took place during weekdays and were conducted in a private room. The places should represent opposite contexts in terms of psychological distance to the targets (adolescent transgressors), with Location 1 high and Location 2 low on average. At both locations, researchers first explained the purpose of the research and participants signed an informed consent form. Each participant had up to 60 min to complete the tasks.

Data analysis

The stage of moral development (Lind, 2011) and C Index (Moral Competency Level) (Lind, 2000) were calculated for each subject and the C index was averaged by study location. The difference between the C Index was considered "high" when larger than five points and "very high" when

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TABLE 1 Sociodemographic characteristics of participants.

Variables	Total sample $N = 234$	Location 1 $n = 157$	Location 2 $n = 77$	P-value[(1)]
		n (%)		
Sex				
Male	108 (46.15)	81 (51.59)	27 (35.06)	0.017*
Female	126 (53.85)	76 (48.41)	50 (69.94)	
Age (years)				
18–28	79 (33.77)	64 (40.77)	15 (19.48)	0.003**
29–39	58 (24.79)	32 (20.38)	26 (33.78)	
40–50	48 (20.51)	26 (16.56)	22 (28.57)	
51–59	25 (10.68)	16 (10.19)	9 (11.68)	
≥60	24 (10.25)	19 (12.10)	5 (6.49)	
Marital status				
Single	111 (47.45)	81 (51.60)	29 (37.66)	0.046*
Married	77 (32.91)	48 (30.58)	30 (38.98)	
Divorced	15 (6.41)	5 (3.18)	10 (12.98)	
Widower	4 (1.70)	3 (1.91)	1 (1.29)	
Stable union	26 (11.11)	19 (12.10)	7 (9.09)	
Not answered	1 (0.42)	1 (0.63)	0 (0.00)	
Religion				
Catholic	139 (59.42)	100 (63.71)	39 (50.66)	0.205
Protestant	51 (21.81)	30 (19.11)	21 (27.29)	
Spiritist	12 (5.12)	8 (5.09)	4 (5.19)	
Candomblé	1 (0.42)	0 (0.00)	1 (1.29)	
Other	6 (2.56)	4 (2.54)	2 (2.59)	
Without religion	19 (8.13)	13 (8.28)	6 (7.80)	
Atheist	4 (1.70)	2 (1.27)	2. (2.59)	
Not answered	2 (0.84)	0 (0.00)	2 (2.59)	
Race (self-declared)				
White	63 (26.92)	46 (29.30)	17 (22.08)	0.113
Black	15 (6.41)	7 (4.45)	8 (10.39)	
Yellow	5 (2.13)	2 (1.27)	3 (3.89)	
Brown	147 (62.84)	98 (62.44)	49 (63.64)	
Indigenous	0 (0.00)	0 (0.00)	0 (0.00)	
Not answered	4 (1.70)	4 (2.54)	0 (0.00)	
Level of poverty				
Non-existent (0%)	51 (21.80)	35 (22.29)	16 (20.77)	0.208
Low (1 to 25%)	43 (18.37)	31 (19.74)	12 (15.58)	
Medium (26–50%)	43 (18.37)	23 (14.65)	20 (25.98)	
High (51 to 100%)	97 (41.46)	68 (43.32)	29 (37.67)	
Occupation				
Intern	22 (9.40)	12 (7.64)	10 (12.99)	< 0.001**
Private employee	35 (14.96)	32 (20.38)	3 (3.89)	
Self-employed	39 (16.66)	26 (16.56)	13 (16.89)	
Public employee	71 (30.35)	29 (18.47)	42 (54.55)	
Others	27 (11.53)	22 (14.01)	5 (6.49)	
Not answered	40 (17.10)	36 (22.94)	4 (5.19)	
Level of education				
Fundamental (incomplete)	14 (5.98)	8 (5.09)	6 (7.80)	0.491
Fundamental (complete)	4 (1.70)	4 (2.54)	0 (0.00)	

(Continued)

TABLE 1 (Continued)

Variables	Total sample $N = 234$	Location 1 $n = 157$	Location 2 $n = 77$	P-value[(1)]
		n (%)		
Medium (incomplete)	14 (5.98)	10 (6.36)	4 (5.20)	
Medium (complete)	52 (22.23)	39 (24.85)	13 (16.88)	
Higher (incomplete)	55 (23.51)	36 (22.94)	19 (24.67)	
Higher (complete)	50 (21.37)	31 (19.75)	19 (24.67)	
Specialization	31 (13.25)	18 (11.47)	13 (16.88)	
Masters	9 (3.85)	6 (3.82)	3 (3.90)	
Doctorate	2 (0.85)	2 (1.27)	0 (0.00)	
Not reported	3 (1.28)	3 (1.91)	0 (0.00)	
Family income (MW)				
Below 2	56 (23.93)	37 (23.56)	19 (24.67)	0.133
Up to 2	26 (11.11)	21 (13.38)	5 (6.50)	
2 to 4	51 (21.80)	37 (23.56)	14 (18.18)	
4 to 10	45 (19.24)	25 (15.93)	20 (25.98)	
10–20	33 (14.10)	19 (12.11)	14 (18.18)	
>20	12 (5.12)	8 (5.09)	4 (5.20)	
Not reported	11 (4.70)	10 (6.37)	1 (1.29)	
Family composition				
Nuclear	120 (51.29)	79 (50.32)	41 (53.25)	0.608
Mononuclear	25 (10.68)	15 (9.56)	10 (12.99)	
Extended nuclear	30 (12.83)	23 (14.66)	7 (9.09)	
Extended mononuclear	7 (2.99)	6 (3.82)	1 (1.30)	
Live alone	18 (7.69)	10 (6.36)	8 (10.39)	
Other	5 (2.13)	4 (2.54)	1 (1.29)	
Not reported	29 (12.39)	20 (12.74)	9 (11.69)	
Victim of juvenile violence				
Yes	132 (56.41)	91 (58.96)	41 (53.24)	0.494
Not	102 (43.59)	66 (42.04)	36 (46.75)	

MW, minimum wage.
[1]Pearson's chi-square (p value < 0.05).
**Values highly significant; *Significant values.

larger than 10 (Lind, 2000). We performed data analysis with conventional statistical tests. Pearson's chi-square test (χ^2) was used to evaluate possible associations between categorical variables with statistical significance less than 0.05. Then, we performed a multivariate analysis by multimodal logistic regression for socioeconomic and sociodemographic characteristics, preference for stages and opinion on the reduction of APM (agree, indifferent, and disagree) as dependent variables.

Results

Table 1 shows that the two locations differed on gender ($p = 0.017$), age group ($p = 0.003$), marital status ($p = 0.046$) and occupation ($p < 0.001$). Most people interviewed at Location 1 were employees in private companies (20.38%), male (51.59%), 18–28 years old (40.77%), single (51.60%). In contrast, Location 2 interviewees were mostly public employees (54.55%), female (69.94%), 29–39 years old (33.78%), married (38.98%). There was no statistically significant difference between the two groups regarding the other variables (Table 1).

Regarding the preference for stages of moral development, the subjects sampled in Location 2 had preference for lower stages (38.96% for stage 1), while in Location 1 the preference was for higher stages (17.19% for stage 6) ($\chi^2 = 30.01$, df = 1, $p = 0.021$). Subjects at Location 2 had a lower level of moral competence (3.97 points) than the public at Location 1 (14.29 points), according to the average C Index that evaluates moral competence, with a "very high" difference (10.32 points).

Table 1 shows the participants' opinions about the proposed reduction in APM according to location. Most people interviewed at Location 1 were in favor of the proposal (81, 51.6%), unlike those interviewed at Location 2, where the majority is against it (36, 46.81%) ($\chi^2 = 24.535$, df = 2, $p < 0.001$). The binomial probability mass function (Ross, 2020)

of the agreement to the question "do you agree with the proposal for decreasing the age of criminal responsibility?" shows that the probability of agreement at location 1 is less than 80%, while in Location 2 is 30% (**Figure 1**).

The typical profile of those in favor of decreasing the APM are men (60, 57.7%) (χ^2 = 14,336, df = 2, $p < 0.001$), married (43, 42.2%) (χ^2 = 13,612, df = 6, $p = 0.034$), catholic (65, 62.5%) (χ^2 = 9,413, df = 8, $p = 0.042$), living in a neighborhood with a high slum level (48, 46.2%) (χ^2 = 6,754, df = 6, $p = 0.049$), with only basic education (47, 45.6%) (χ^2 = 15,219, df = 4, $p = 0.004$), and earning less than 2 minimum wages (34, 34.3%) (χ^2 = 11,920, df = 10, $p = 0.005$).

There was also an association between the preference for stages of moral development and opinion on decreasing the APM for the participants from Location 2: there was a preference for stage 1 among those who disagreed and for stage 6 among those who agreed (χ^2 = 20,665, df = 10, $p = 0.024$).

The multivariate analysis by multimodal logistic regression identified two variables that are associated with the difference in opinion on the reduction of APM: Local (χ^2 = 16,232, df = 2, $p = 0.001$) and sex (χ^2 = 8,828, df = 2, $p = 0.012$) (**Table 2**). A further analysis showed that 64.4% of women in Location 2 disagreed with the reduction in the criminal majority (χ^2 = 18,344, df = 2; $p < 0{,}001$) (**Table 3**).

Discussion

According to the Brazilian National Register of Adolescents in Conflict with the Law, in 2019, 189,000 adolescents were sentenced to socio-educational measures in the country, twice the number recorded in 2018 (96,000). The escalation of juvenile delinquency represented by those numbers and the spread of misinformation and fear about crime (Ambrey et al., 2014; Intravia, 2019), has increased the popular outcry for more severe and punitive measures for juvenile offenders. This led to several proposals of constitutional amendment to decrease the APR from 18 to 16 y.o. (Vavassori and Toneli, 2015). The first proposal from 1993 is based on the argument that due to greater access to information, the "discerning capability" of today's youngsters is higher than in the 1940s when the APR was initially determined in Brazil. This reasoning is, together with the justification that "if they can vote they should be criminally imputable as well," very popular with supporters of the reduction of the APR.

While juvenile transgressions receive a large share of attention (Pizarro et al., 2007), especially in populist discourse, the fact is adolescents are also a main target of violence. For instance, not only the two main causes of mortality among male adolescents are road injury and interpersonal violence, but mental disorders, including childhood behavioral, anxiety, and depressive disorders, are among the leading causes of morbidity among adolescents of both sexes and across age groups (Guthold et al., 2021). In Brazil (with data from only 18 of the 26 federal states), 29,512 adolescents aged 15–19 y.o. met intentional violent deaths, during 2016–2020, an average of 5,902.4 per year (UNICEF, 2021).

Socio-cognitive considerations

The proposals for the decrease in the APR currently being considered by the Brazilian parliament runs against scientific evidence suggesting that the timespan of human adolescence is steadily increasing (Steinberg, 2014) and, if anything, the APR should also increase in order to protect and rehabilitate adolescent transgressors (Sawyer et al., 2018). Thus, in effect, such a measure will probably fail in meeting the objectives of fighting crime and violence.

We hypothesize that proposals for harsher juvenile justice legislation and the dismantling of the protections guaranteed to adolescents in conflict with the law results, in part, from a construal heuristic that is influenced by psychological distance to the problem and its social circumstances. Our findings give support to this hypothesis and show that subject's agreement with the proposal to decrease the APR are correlated with moral development. Though morality is primarily a philosophical, rather than a behavioral, concept, it nonetheless informs decisions that have serious social implications. Differences in moral development in adults are not just differences in perception or comprehension of a situation.

Kohlberg proposes that at lower stages, as opposed to higher stages, morality is more subject to redefinition by specific context and by one's social frame of reference and less by a fixed set of universal abstract moral principles. This is supported by our findings showing that subjects at lower stages of moral development tended to disagree with the proposal to decrease the APR. Individuals with lower levels of moral competence tend to advocate harsher punishment for transgressions while suppressing their moral judgment regarding their behavior. This can be explained by the greater reliance on cognitive heuristics associated with system 1 processes during moral judgments, viz-á-viz dual-process theory (Campbell and Kumar, 2012).

Socio-demographic considerations

Our results also highlight the influence of socio-demographic factors, such as income, gender, marital status, religion, and education on opinion about the APM. For instance, subjects with lower income who live in neighborhoods with a high slum level tend to be in favor of the proposal while those with a higher income and who live in areas with low slum levels tend to disagree. This conflicting result could be explained by the widespread criminalization of "dangerous" peripherical neighborhoods in the media and an increased

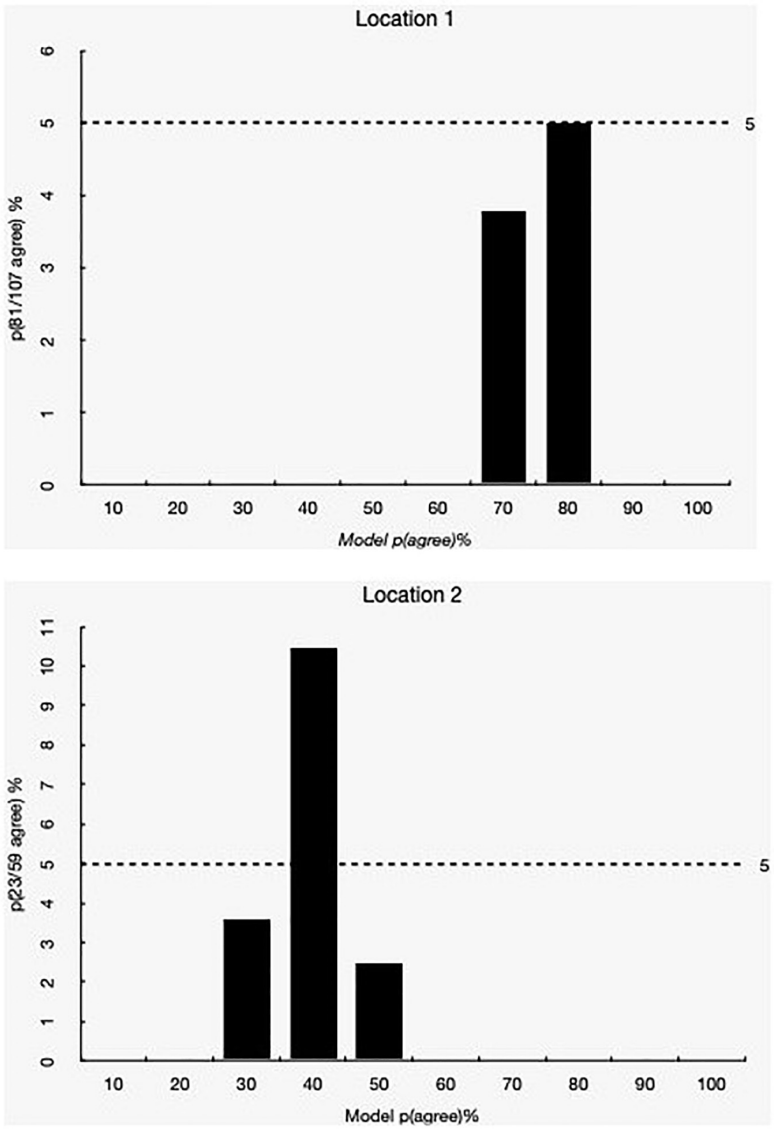

FIGURE 1
Probability mass of binomial distribution of agreement with the reduction of the APM at locations 1 **(A)** and 2 **(B)**.

perception of their higher exposure to youth violence. The content of crime-related media is a determining factor in the perception of crime risk (Callanan, 2012) and may encourage individuals to be more punitive in their opinions. Regarding gender, our results show that men tend to be more favorable to the proposal of reducing the APM. Other studies also point to divergences between the sexes regarding decision-making and moral judgment (Capraro and Sippel, 2017; Acevedo-Triana et al., 2019). Both utilitarian and deontological rationalities founded in the notion of genetic and cultural co-evolution could explain the existing differences between the actions and the moral feelings of men and women. Studies have shown that there is a difference in moral assessment according to Efferson and Glenn (2018) and this could be explained by evolutionary pressure on reward pathways in the brain (Wilson et al., 2013; Soutschek et al., 2017). Gender differences in altruistic behaviors in humans show that women tend to be more equalitarian than men (Andreoni and Vesterlund, 2001) and could be less sensitive to construal imperatives.

As for marital status, while married people tend to agree with the decrease of the PAM, singles remain indifferent and divorced people disagree. This divergence in opinion may be related to the different familial experiences of these groups. Married people generally have more experience with other people depending on them, both materially and emotionally.

TABLE 2 Multimodal logistic regression for the "agree" opinion on reduction of the age of penal majority.

Variables	β	Wald	Significant	OR	IC 95%
Local	1.492	13.083	0.000**	4.445	1.981–9.974
Sex	1.210	8.281	0.004**	3.352	1.471–7.641
Age (years)	−0.062	0.118	0.731	0.940	0.661–1.336
Marital status	0.296	0.644	0.422	1.345	0.652–2.772
Religion	−0.280	3.598	0.058	0.756	0.566–1.009
Race (self-declared)	0.252	3.083	0.079	1.286	0.971–1.704
Level of poverty	0.196	1.252	0.263	1.217	0.863–1.716
Occupation	−0.041	0.097	0.755	0.959	0.739–1.245
Level of education	0.064	0.022	0.883	1.067	0.451–2.521
Family Income (MW)	−0.228	2.879	0.090	0.796	0.612–1.036
Family composition	0.654	2.610	0.106	1.923	0.870–4.253
Victim of juvenile violence	−0.288	0.540	0.462	0.750	0.348–1.615
Levels of reasoning	0.116	1.080	0.299	1.123	0.902–1.399

**Highly significant.

TABLE 3 Crossover between variables sex, location and opinion on the reduction of APM.

Variables		Total sample $N = 234$	Opinion			P-value[(1)]
			Agree ($n = 104$)	Indiferent ($n = 68$)	Disagree ($n = 62$)	
		N (%)		n (%)		
Male	Location 1	81 (75.0)	47 (78.3)	24 (77.4)	10 (58.8)	0.244
	Location 2	27 (25.0)	13 (21.7)	7 (22.6)	7 (41.2)	
	Total	108 (100.0)	60 (100.0)	31 (100.0)	17 (100.0)	
Female	Location 1	76 (60.3)	34 (77.3)	26 (70.3)	16 (35.6)	0.001**
	Location 2	50 (39.7)	10 (22.7)	11 (29.7)	29 (64.4)	
	Total	126 (100.0)	44 (100.0)	37 (100.0)	45 (100.0)	

[1]Pearson's chi-square (p value < 0.05).
**Highly significant.

This may lead them to feel more insecure regarding the prospect of urban violence which can affect not only themselves but those they care while being predisposed to be more punitive (Gopalkrishnan, 2018).

In terms of religion, Catholics tend to agree more with the proposal to decrease the APR while those without religion or atheists tend to disagree. Religion and notions of morality are deeply intertwined in human cultures (Purzycki et al., 2018). The notion of religion as a precondition to morality is largely prevalent in Brazil, where more than 83% of respondents in a multinational survey agree that morality is impossible without belief in god (Pew Research Center for the People and The Press, 2007). Thus, this majority is strongly influence by the perceived religious content of moral issues and usually adhere to a conservative worldview which is more intolerant on youth transgressions and argue for stronger punitive measures (Muncie, 2008).

Educational level significantly influences opinion on the APR. While those with only basic education tend to agree with the reduction of the APR, subjects with higher education stand with the opposite. This difference of opinion can be explained by the effect of knowledge on construal abstraction of events proposed by Kyung and coworkers (Kyung et al., 2014) that the more knowledge about an issue, the greater the possibility of contextual proximal influence on the opinion we form of people or events. Those with only basic education may prioritize basic ontogenetic principles in decision making, influenced, in most cases, by religion and family (Ho et al., 2015).

Conclusion

Proposals for the reduction of the APR are motivated by a combination, among other factors, of fear of violence, distrust of juvenile rehabilitation/correctional programs, and a widespread misunderstanding of adolescent behavior. Though the central goal of rehabilitation is desistance of crime,

most implementations put too much emphasis on the agency of the offender, leaving out societal responsibilities in ensuring adequate conditions for decreasing recidivism. Societal responsibilities are especially important regarding juvenile offenders, which are undergoing a dynamic process of cortical maturation which leaves them susceptible to impulsive behavior and increased vulnerability to peer-pressure. In general, especially after the advent of social media, society has adopted an increasingly punitive mentality, with people being easily canceled and condemned to social death. Thus, it does not seem surprising that populist punitive initiatives such as the reduction of the APM enjoy widespread support. This support is also motivated by a misguided perception of cognitive agency in adolescents, which is contrary to scientific findings regarding the adolescent mind (Steinberg, 2014). Most experts recommend that rehabilitative approaches combining the therapeutic and desistance paradigms seem to be more appropriate to dealing with adolescent transgressors and helping crime rates decrease (Droppelmann et al., 2022).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors under reasonable request.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics and Research Committee with Humans of the Federal University of Pará (UFPA) (approval #2.150.425). The patients/participants provided their written informed consent to participate in this study.

Author contributions

IC, IP, and AP designed the experiments and collected the data. IC, IP, KL, HM, PB, RM, and AP analyzed the data. IC, IP, RM, and AP wrote the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The tendency to dehumanize, group malleability beliefs, and perceived threat from migrants in Hungary

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Examining the humanness attributed to several groups in a comprehensive Hungarian sample (N=505) at the height of the "European refugee crisis of 2015," we found that Hungarians dehumanize Eastern ethnic groups more and Western ethnic groups less than they do to their own ethnic ingroup. Interestingly, we also found that a general tendency of dehumanization is expressed across all national groups. This general tendency of dehumanization was strongly associated with threat perceived from migrants, but the relationship was mediated by group malleability—the belief that human groups can change and are not set in their ways irreversibly. Malleability beliefs were negatively linked to dehumanization tendencies and threat perceived from migrants. We discuss the theoretical and practical implications of the findings that point to the critical role of fixed mindsets about groups in the mechanisms linked to prejudice in a highly xenophobic Hungarian context.

KEYWORDS
dehumanization, group malleability, threat, Hungary, migrant, refugees, essentialism, prejudice reduction

Introduction

> *"Meanwhile, all security experts in the world have already told that there are obviously IS terrorists in the hordes swarming into Europe. Because even if they are animals, they are not stupid."*
>
> Zsolt Bayer (founding member of Hungarian populist ruling party, Fidesz, on refugees).[1]

Sociopolitical background and the perception of asylum seekers in Hungary

In the course of 2015, over a million asylum seekers, many of them fleeing from the Syrian civil war, arrived at the borders of the European Union, tipping it into a humanitarian

1 https://www.magyarhirlap.hu/velemeny/Elkerulhetetlen

crisis—arguably the continent's worst since World War II. The reception was mixed. In Sweden or Germany, they found a predominantly warm welcome, but as the migration wave intensified the expression of hostile attitudes, both in the press and in the highest political circles, became increasingly common. Denmark passed a law allowing the confiscation of asylum seekers' valuables to finance their welfare provision and Hungary, one of the countries along the main overland migration route, erected a 4-m-high fence on its southern border, sealing off the country to unmonitored border-crossings. Launched with a national anti-immigrant billboard campaign in this period, the government subsequently made xenophobic propaganda the central message of its political communication. Building on the Hungarian population's exceptionally xenophobic sentiments [Nyíri, 2003; European Social Survey European Research Infrastructure (ESS ERIC), 2022], in the years following, they linked everything, from high culture to the coronavirus, to the threat of immigration. Consequently, fear of culturally dissimilar immigrants in the country rose further and the government sailed to sweeping re-elections.

Yet, in 2015, it was not only Hungarian public discourse that took a nefarious turn; degrading voices and dehumanizing rhetoric became prevalent across European media even surfacing in its moderate mainstream (Chouliaraki and Stolic, 2017). The influx of refugees to the EU decreased in the following years, but with the war in Ukraine, it may soon surpass the number of those coming from the Middle East previously. Xenophobic political profiteering across the EU creates tension that the block must address as its population ages and it increasingly relies on immigrants to fill jobs in the care economy and various other sectors.

Understanding the perception of refugees and the potential leverage points for interventions to target can facilitate the successful integration of the newcomers. Our study explored the link between Hungarians' proclivity to dehumanize and the threat they perceived from migrants, theorizing that thinking of people and groups as malleable entities could attenuate the link between threat and dehumanization.

Prior research on dehumanization of refugees

Dehumanization, the denial of full humanness, attracted attention in the social sciences after World War II, yet experimental social psychology's interest has only been drawn to the topic in the past 20 years (Haslam and Loughnan, 2014; Haslam and Stratemeyer, 2016). Seminal work on infrahumanization by Leyens et al. (2000, 2007) focused not so much on genocide or war contexts, but on subtle manifestations of dehumanization between groups that compete within fundamentally peaceful and prosperous conditions (Vaes et al., 2003). Subtle dehumanization has been studied in humanitarian contexts ranging from natural disasters, (Cuddy et al., 2007; Andrighetto et al., 2014) to immigration, where Esses et al. (2013) demonstrated how media portrayals and three tropes—refugees as (1) vectors of infectious diseases, (2) bogus queue-jumpers, and (3) claimants harboring terrorists - contribute to the dehumanization of asylum seekers in the Western world. These three tropes featured heavily in European media during the 'migrant crisis', compounded by Islamophobic voices that framed the influx of migrants as a threat to a 'Christian Europe'. While findings demonstrate the relevance of studying subtle forms of dehumanization, others have recently argued for the need to re-focus attention on its blatant forms, reasoning that these mechanisms are more relevant for hostile behavioral outcomes (Kteily and Bruneau, 2017). With their single-item measurement, the 'Ascent of Man', they have presented evidence suggesting that blatant and subtle dehumanization are distinct constructs with differentiable effects (Kteily et al., 2015). They found blatant dehumanization a better predictor of hostile outcomes, such as support for aggressive anti-terrorism policies or retaliatory violence, and more strongly and consistently linked to the support for hierarchy than subtle forms of dehumanization. During the 2015 European 'migrant crisis', they found that blatant dehumanization played an important role in the rejection of Muslim refugees throughout the continent over and above political ideology and prejudice (Bruneau et al., 2018).

The present work builds on this theoretical background, adapting it for a Hungarian context, where research demonstrates how dehumanizing rhetoric and migrant-related fearmongering are intertwined in media and public discourse (Bernáth and Messing, 2016)—a link needing no further psychological replication (Bruneau et al., 2018). But as frames and discourse shape thinking and sentiment above and beyond their narrower focus (Price et al., 1997; Moskowitz, 2005), in this case the single target group on which it centers, we theorized that due to the all-permeating nature of xenophobic reporting and communications (Kalmar, 2020) in Hungary, a more general tendency of dehumanization (affecting humanity perceptions regardless of group membership) may emerge. Conceptualized on a general level we still expected it to be strongly associated with perceived threat from migrants (both driven by the same media coverage and discourse), but hoped to find a mediator of this link, which could provide insights for prejudice-reduction efforts.

Implicit theories of personality and the malleability of groups

Research on lay or implicit theories of personality distinguishes fixed (entity) and dynamic (incremental) mindsets: the former holds that personal characteristics are fixed entities, even if one strives to change them, while the latter refers to the belief that personal characteristics are malleable and can change with time or conscious effort (Levy et al., 2001). Pioneered in educational research, implicit theories about human nature have also proved relevant in the domain of group perception. Levy et al. (1998) found that people with fixed mindsets are more likely to endorse, regardless of their valence, societal stereotypes; are more likely to hold negative views about outgroups in times of

intergroup conflict; to perceive greater homogeneity within the outgroup; and consequently apply stereotypes more indiscriminately to outgroup members. For entity theorists, traits are a key tool for understanding groups—they do not only see less difference between members of one group but perceive bigger differences between members of different groups. Accordingly, entity theorists are more likely to discriminate against outgroups by recommending harsher punishments for the same crime.

These findings suggest that in the context of intergroup conflict and contact, fixed mindsets foster selective information processing that confirm pre-existing stereotypes, which often leads to entrenched negative views undermining intergroup contact and increasing hostility. Halperin and colleagues have presented corresponding results in the context of protracted intergroup conflict (Halperin et al., 2011, 2012; Goldenberg et al., 2017, 2018). They found beliefs in group malleability a major facilitator of motivations to make intergroup contact and have also demonstrated that intergroup contact was only fruitful when coupled with beliefs about the malleability of the outgroup. Increasing group malleability perceptions led to lower levels of intergroup anxiety and higher motivation to interact with members of the outgroup. In a different post-conflict setting, Bruneau et al. (2022) found group malleability beliefs the most potent mediator (over and above affective pathways like increased empathy or reduced prejudice) between a media intervention that promoted support for peace and the humanization of ex-FARC combatants in Colombia.

While social theory has long (Pico Della Mirandola, 2012) seen the uniqueness of the human species in their ability to change and transform themselves, dehumanization research has only recently started to incorporate the concept of malleability (Bruneau et al., 2022; Landry et al., 2022). In a context where government communications draw on essentializing tropes that emphasize the difference between Hungarians and migrants (laying the foundation for more derogatory stereotyping of the latter), we hypothesized that one's willingness to reject essentialism and believe that groups can change their ways would mediate the link between perceptions of humanity and threat from migrants. Perceiving migrants as threatening could be coupled with lower belief in people's ability to change and could lead to more readiness to dehumanize people. Conversely if people see more animalistic characteristics in various in- and outgroups, they may also see humans less capable of changing or learning, which can, in turn, further fuel fear and threat perceptions from migrants who are depicted in dehumanizing and fearmongering ways in Hungarian media. Hungarians lack contact with migrants and actionable interventions need to find levers to reduce threat perceptions and dehumanization tendencies – we hoped to identify one in malleability beliefs.

Overview of the present research

First, we assess the self-reported blatant dehumanization of different national groups living in Hungary to understand their relationship. Perceptions of global developmental hierarchies are consistent across countries worldwide (Thornton et al., 2012) and Hungary fits this trend, whereby Western European nations are seen as more sophisticated, compared with poorer Eastern European and Asian nations.[2] Building on these lay perceptions, target groups were selected based on the combination of Human Development Index, GDP/capita, and geographical position relative to Hungary. We selected Germany, Denmark, and the United States as higher and Romania, Turkey, and Bulgaria as lower status countries. Curious if this West–East slope would materialize in the perception of the ingroup, we included three subsets of the Hungarian populace: those who migrated to Western Europe, those who live in Hungary, and those who live in neighboring countries.[3] Besides a West–East slope in the dehumanization of groups, we expected that group-specific expressions of dehumanization would cluster by geographic region.

After examining the factor structure of dehumanization, we turn to the relationship between this construct, malleability, and threat perceived from migrants. Xenophobia levels are generally higher in Eastern Europe than in the rest of the continent (Doebler, 2014), but even within the region Hungary has been becoming a negative outlier since the 1990s [European Social Survey European Research Infrastructure (ESS ERIC), 2022]. Before migration surged in 2015, xenophobia predominantly manifested in antisemitism and antigypsyism, rather than hostility toward immigrants and Muslims, but following the government-led anti-immigration propaganda the rejection of, and threat perceived from refugees and Islam also climbed to the highest among EU countries [European Social Survey European Research Infrastructure (ESS ERIC), 2022].

In the Hungarian social, political, and media context, a strong association between the dehumanization of Eastern groups and threat perceived from migrants could almost be taken for granted. We were interested in exploring if amid discourse so laden with dehumanizing rhetoric we could instead find a more general readiness to see others as less than human, regardless of group membership. If such a general tendency of dehumanization emerged, we expected it to be linked to higher threat perceived from migrants—those who were more concerned about migrants would also be more ready to dehumanize. With an eye on future interventions, we were also hoping to establish a mediator that could be the basis of efforts to attenuate the link between threat and general

2 Findings on the link between dehumanization and the social status of the target group are mixed – while there are studies to suggest (Lammers and Stapel, 2011; Capozza et al., 2012; Fourie et al., 2022) that the low status of a target group predicts its dehumanization, others (Rodríguez-Pérez et al., 2011) found no such relationship across perceptions of various national groups globally. This could be explained by the differential dehumanization tendencies associated with low and high-status groups (Sainz et al., 2019).

3 After WWI Hungary lost significant part of its territory, and up until today there is a diaspora of about 1.5 million Hungarians who preserved their language and culture in neighbouring countries.

dehumanization, or indeed the reduction of either. Malleability perceptions lent themselves for this mediating role as a negative relationship could be expected with both threat and dehumanization—the less one believes that individuals and groups can change the more likely they would be to dehumanize them and the more readily they would perceive migrants as a threat too. In the present study, we sought to establish a relationship pattern, on which experimental work could build in the future.

Materials and methods

Participants and procedure

This study employed a comprehensive probability sample of Hungarians who used the Internet at least once a week (see Supplementary materials for details). The present research was conducted with the approval of the Institutional Review Board of the related university and following the Declaration of Helsinki. Participants received detailed information about the aims of the research project, they were assured of anonymity and provided informed consent.

The final sample of 505 Hungarian respondents who gave valid answers was nationally representative, among those who use the Internet at least once a week, for gender (female = 258; 51%), age (M_{age} = 40.19 years; SD_{age} = 11.79 years; range 18–60 years), educational attainment (18% primary, 33% secondary, and 49% tertiary), and place of residence (18.6% capital city, 21.4% county capitals, 31.5% towns, 28.5% in villages).

Measures

Blatant dehumanization

We used the adapted version of the Ascent of Man (Kteily et al., 2015) to capture blatant dehumanization of different groups (e.g., Bulgarians who live in Hungary, Danes who live in Hungary, Hungarians) to assess the intercorrelation between the blatant dehumanization of different social groups. Respondents rated how evolved each group was on an 11-point (ranged between 0 and 10) scale presented below in Figure 1. For the path model, we reversed the scale for higher scores to correspond to more dehumanization.

Perceived threat

We adapted and complemented Stephan et al. (2002) threat scale using Beaton et al. (2000) protocol. Seven items (α = 0.96), both realistic and symbolic, measured the individuals' level of perceived threat from migrants (e.g., *"Migrants represent health risk to Hungarians"*). Respondents indicated their level of agreement using a five-point scale ranging from 1 (Strongly disagree) to 5 (Strongly agree), with higher scores indicating higher levels of perceived threat.

Groups' malleability beliefs were measured with four items (α = 0.95; e.g., *"As much as I hate to admit it, you cannot teach an old dog new tricks – groups cannot really change their basic characteristics."*) rated on a scale from 1 = strongly disagree to 6 = strongly agree (Levy et al., 1998; Halperin et al., 2011). For the model, we computed the composite so that lower scores indicate more fixed, whereas higher scores represent more incremental mindsets.

Statistical analyses

Descriptive statistics were produced in SPSS 22, the latent-variable path model was built in Amos 21 using maximum-likelihood estimator (See Figure 2). Multiple goodness-of-fit indices were used (Browne and Shapiro, 2015, see Supplementary materials). For internal consistency, Cronbach's alpha values were estimated and observed following the guidelines of Nunally and Bernstein (1978) regarding the acceptability of the value (0.70 acceptable, 0.80 good).

Results

Descriptive data for the dehumanization of different national groups showed a West–East slope (see Supplementary materials;

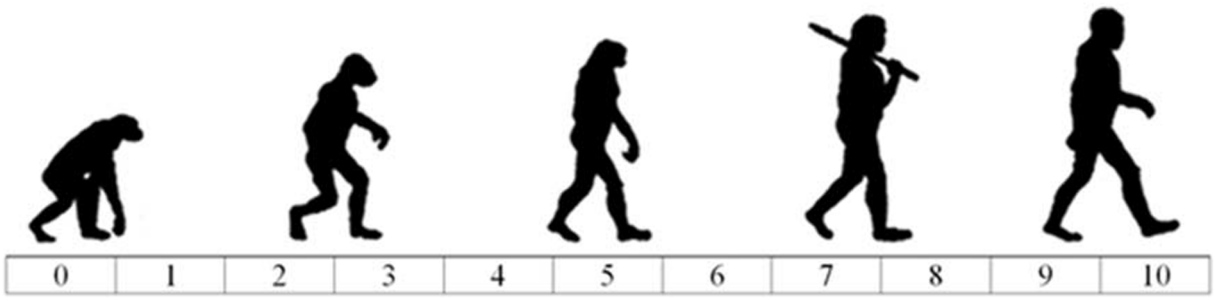

FIGURE 1
The adapted version of Blatant Dehumanization (Ascent of Man). Instruction: "People can vary in how human-like they seem. Some people seem highly evolved, whereas others seem no different than lower animals. Using the image below as a guide, indicate using the sliders how evolved you consider the average member of each group to be."

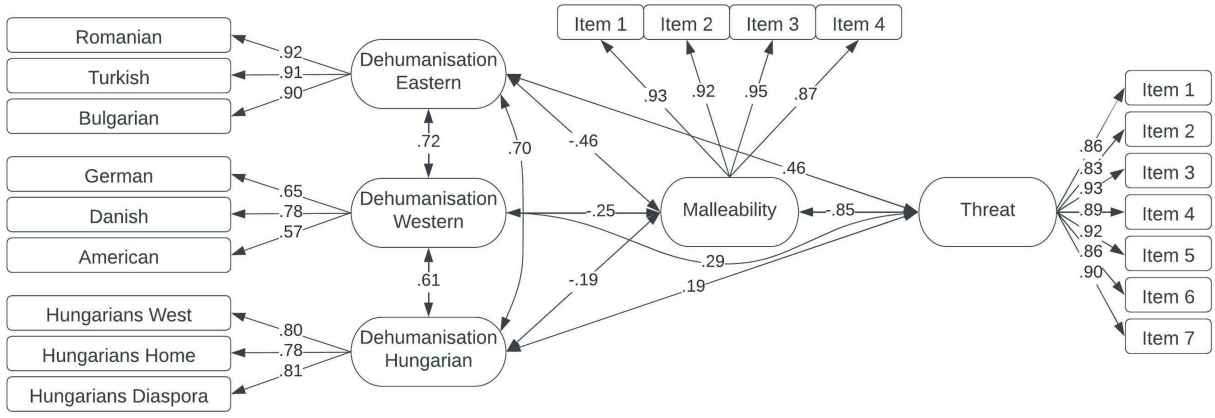

FIGURE 2
The results of structural equation modeling. Higher dehumanization scores indicate stronger dehumanization, higher malleability scores indicate more malleability and higher threat scores mean stronger threat. Single-headed arrows represent standardized regression coefficients and double-headed arrows represent covariances. All pathways were significant at $p<0.001$.

TABLE 1 Descriptive statistics and intercorrelations between the prejudice variables.

	Range	Mean	SD	1	2	3	4
1. Dehumanization Western	0–10	9.19	1.13	_			
2. Dehumanization Hungarian	0–10	8.46	1.78	0.465**	_		
3. Dehumanization Eastern	0–10	7.48	2.34	0.583**	0.608**	_	
4. Malleability	1–5	4.25	1.52	−0.207**	−0.158**	−0.399**	_
5. Perceived threat	1–5	3.33	1.37	0.254**	0.168**	0.418**	−0.808**

SD, standard deviation; all correlations were significant at $^{**}p<0.001$.

Table 1); Germans were rated as the most evolved followed by Danes and Americans, whereas Turks were rated as the least evolved followed by Romanians and Bulgarians, with Hungarians sitting in between the Western and Eastern outgroups. This West–East slope was expressed even within the ingroup, but these differences did not reach statistical significance.

According to a simple and parsimonious first-order confirmatory factor analysis (see loadings and covariances in Supplementary materials; Figure 1, CFI = 0.986; TLI = 0.979; RMSEA = 0.056 [90%CI 0.027–0.083]), three factors can be distinguished referring to Eastern dehumanization (Romanian, Bulgarian, and Turkish), Western dehumanization (Danish, German, and United States), and Hungarian dehumanization factors (Western diaspora, Eastern diaspora, and Hungarians in Hungary). Next, we investigated how the three factors (Eastern, Western, and Hungarian) of dehumanization are related to threat and how the links are mediated by group malleability (for descriptives, see Table 1 and for the path model see Figure 2).

Without assumptions about the direction of causality, we calculated covariances between the latent variables. Fit indices were acceptable (CFI = 0.970; TLI = 0.965; RMSEA = 0.059 [90%CI 0.053–0.066]). Dehumanization of Eastern groups had a moderate and negative association with group malleability ($\beta = -0.46$, $p<0.001$), which, in turn, was strongly negatively linked with perceived threat from migrants ($\beta = -0.85$, $p<0.001$). Furthermore, dehumanization of Eastern groups was positively related to threat ($\beta = 0.46$, $p<0.001$). We can see a similar relationship pattern between Western and Hungarian dehumanization and group malleability ($\beta = -0.25$, $p<0.001$, $\beta = -0.19$, $p<0.001$) as well as threat ($\beta = 0.29$, $p<0.001$, $\beta = 0.19$, $p<0.001$) with somewhat weaker relationships. The link between the three dehumanization factors and threat from migrants is weaker compared with the link between malleability and threat. We found that group malleability perceptions mediated the link between dehumanization of various groups and perceived threat from migrants.[4]

Discussion

In our study, we set out to assess the blatant dehumanization of different national groups and how tendencies to dehumanize are linked to perceiving migrants as a threat and incremental mindsets about human groups. We hoped that malleability beliefs

4 Moderation analyses demonstrated that interaction between dehumanization and malleability was not significant on threat ($p=0.93$). This was not only the case for overall dehumanization, but for the Eastern ($p=0.79$), Western ($p=0.48$) and Hungarian ($p=0.83$) groups' interaction with malleability.

could disrupt the self-perpetuating cycle between threat perceived from migrants and general dehumanization tendencies—that belief in the ability of human groups for change could be a lever for interventions looking to alleviate xenophobia in a challenging Hungarian context—after proving its utility in basic (Landry et al., 2022) and applied (Bruneau et al., 2022) science.

We replicated the mental slope of evolvedness that had been established in previous Hungarian studies: participants rated Western nations as the most evolved, followed by Hungarians, and rated the Eastern (relative to Hungary) nations as the least evolved (Melegh, 2006). We then went on to assess how attributing humanity to different target groups is associated with perceived threat from migrants and implicit theories about the malleability of a group and its members. Based on previous research on intergroup conflict (Halperin et al., 2011; Weiss-Klayman et al., 2020), we expected that the link between the dehumanization of others and perceived threat would be mediated by general perceptions of group malleability and this we indeed found. Our model revealed that the negative relationship between the tendency to dehumanize and perceived threat was partially mediated by group malleability perceptions. One interpretation is that the more one saw the humanness of other people in general, the more likely they were to see people as malleable, and the less threat they perceived from migrants. Conversely, the more one saw other people as animals, the less likely they were to see people as malleable and the more threat they perceived. Another interpretation is that perceived threat can lead to dehumanization through the belief that groups cannot change—for those who hold incremental views about social groups threat leads a lot less to dehumanization. From this perspective, migrant threat could decrease group malleability perceptions which then contributes to dehumanization.

Theoretical implications

Proliferating dehumanization research in the past two decades has identified individual differences and situational factors that make people more likely to mentally strip others of their full humanity. Studies have established social dominance orientation as a reliable individual difference variable predicting differences in the dehumanization of outgroups (Haslam and Loughnan, 2014), whereas a more affective approach showed that disgust-sensitivity is one non-attitudinal trait enhancing the likelihood of outgroup dehumanization (Hodson and Costello, 2007; Buckels and Trapnell, 2013). More contextual contributing factors of dehumanization include power (Lammers and Stapel, 2011), threat (Goldenberg et al., 2009; Kteily et al., 2016), and motives to enhance the ingroup (Castano and Giner-Sorolla, 2006).

Our high intercorrelations between the perceptions of several groups' humanity are strongly indicative of a tightly knit mental web where a forceful impact on the perception of a single group's humanness will not be compartmentalized but affect the dehumanization of other groups too. Research on dehumanized perception argues that perceiving the mind of others is an effortful social cognitive mechanism that may or may not be spontaneously engaged, depending on a host of situational variables (Harris and Fiske, 2011). Prior research investigated the evaluation of several target groups by the same respondents (Kteily et al., 2015); however, our results are the first to establish that in Hungarian peoples' minds the perception of one group's humanness is closely linked to that of other groups and the tendency to dehumanize is expressed consistently across the explicit ratings of different target groups on the Ascent of Man scale. While only further research can establish whether this is a consistent individual difference, independent from specific group membership, we believe that considering the individual's tendency to de/humanize and not only conceptualizing dehumanization as a difference score between in- and outgroup perceptions can extend our understanding of intergroup relations, especially in contexts where public discourse is increasingly polarized (US) or where control over media is used to fuel dehumanizing rhetoric (in several hybrid regimes).

With flare-ups of antigypsyism and homophobia in recent years, it is our concern that hostile and dehumanizing discourse of one vulnerable group in Hungary (in this case refugees) can facilitate the expression of hostile attitudes toward other vulnerable groups, especially when aided by derogatory media coverage. As long as group-based perceptions of humanity remain tightly connected, attitude change toward a single outgroup (like Muslim refugees) could also face obstacles. If one is motivated to enhance the ingroup, by maintaining the 'humanness gap' to the outgroups, the limit to the ingroup's further humanization can determine the extent to which perceptions of other groups can improve.

Applied implications

Behavioral and communication interventions need to find the opening in the process of attitude formation to successfully address fearful and hostile feelings toward immigrants. The idea that humans are the only species capable of transforming themselves has been present in intellectual history since at least the renaissance, so it should come as no surprise that incremental views about social groups have a significant ability to neutralize the link between perceived threat and the animalistic representation of others. This result dovetails with findings on how the promotion of incremental mindset about groups and, in particular, the threatening outgroup, is a most promising avenue toward fostering dialog and tolerance (Halperin et al., 2011, 2012). This dialog and the majority's motivation to connect will be key for the hopes of peacefully and successfully integrating newly arrived refugees in Europe.

Though the discourse around immigration took a hostile turn during the 'European migrant crisis of 2015', Hungary is still an outlier in Europe in that its government spends vast sums on xenophobic campaigns. While research from elsewhere (Prati et al., 2015) offers counter-stereotypes as a lever, very few prejudice-reduction interventions are effective in the Hungarian context (Orosz et al., 2016). Based on our findings future experimental

studies seeking to decrease dehumanization should strongly consider the manipulation of malleability perceptions. Perceived threat is actively stoked by government communications in the country and group malleability could be one of the few keys to minimizing perceived threat's automatic translation into more general outgroup derogation. Finally, our results suggest that practitioners working on the integration of newcomers would benefit from thinking about perceived threat, dehumanization, and malleability perceptions in host communities (cf. McLoughlin and Over, 2019).

Limitations

Though we had a comprehensive sample, representative in many respects, the over-representation of participants with higher levels of education could be perceived a limitation of our sampling method that collected data from those who use the internet at least weekly. Additionally, although the Ascent of Man measure has excellent psychometric properties, all measures were self-report scales, and future research exploring the relationship between dehumanization, malleability, and perceived threat should consider the usage of implicit or behavioral measures that are less susceptible to respondent bias. Perhaps in less galvanized European countries, dehumanized perceptions of specific target groups are more segmented and do not covary with the dehumanized perceptions of other groups. To find out, research should replicate our results across countries, with relevant target groups. Finally, we intentionally used covariances in the model, as our correlational design does not allow for causal inference (see Rohrer et al., 2022 for more on the limitations of path models). Future intervention studies building on our findings will need to employ experimental designs to verify causal directions between the investigated concepts.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Eotvos Lorand University, Kutatasetikai Bizottsag (KEB). Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Author contributions

BP and GO contributed to the study design, literature review, data gathering, manuscript writing, data analysis, and interpretation. All authors commented on the draft and contributed to the final version, approved the publication of the manuscript, and agreed to be accountable for all aspects of the work.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.910848/full#supplementary-material

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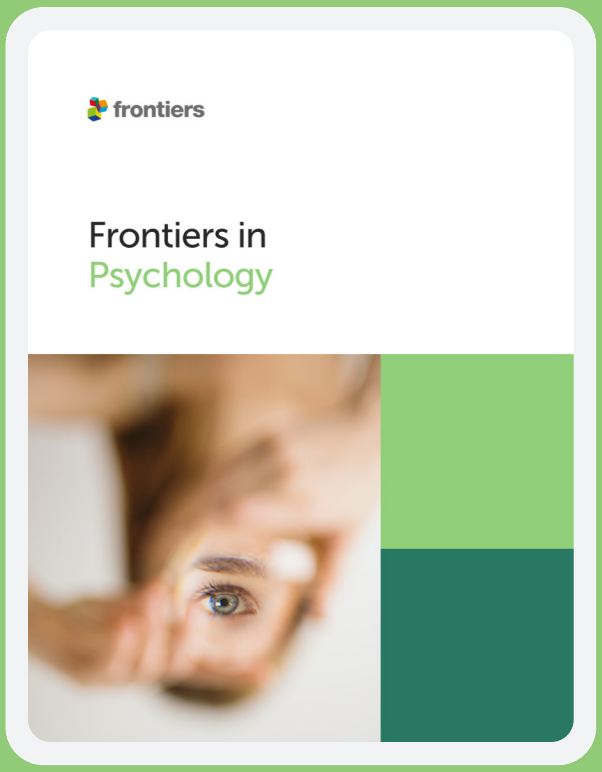

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