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Mental health promotion and suicide prevention in a changing world

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Mental health promotion and suicide prevention in a changing world

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Editorial: Mental health promotion and suicide prevention in a changing world

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mental health promotion, suicide prevention, COVID-19, mental vulnerability, self-esteem

Editorial on the Research Topic
Mental health promotion and suicide prevention in a changing world

Mental Health Promotion and Suicide Prevention in a Changing World (July 2021 to June 2022) was a special research project conducted during the global spread of COVID-19. Our project editors were concerned that individuals' mental wellness could be vulnerable due to the pandemic and other concurrent natural or man-made disasters (e.g., earthquakes and regional conflicts). Moreover, bereavement, unemployment, and economic recession due to these disasters could further build up emotional stress upon the public. Meanwhile, pandemic regulations administered in each community (e.g., lockdowns and social distancing measures) might further undermine social support. Consequently, the risk of suicidal ideation and behavior during these changing times could be concerning. This project aims to follow the above research concerns. In total, 14 studies were published *via* this research project, with dedications by 103 authors, 26 reviewers, and five editors. Five essential research questions were discussed among these researchers:

WHOM should we be concerned about?

In this project, researchers investigated mental health-related issues with people from aboriginal communities in Aotearoa/New Zealand (e.g., the Māori people; Pavlova et al.), Asian cultures (e.g., Indians; Ramesh et al.), and Western countries (e.g., Germans; Kohls et al.). Participants of this project covered children (e.g., Kohls et al.), adolescents (e.g., Li, Zhan et al.), young adults (e.g., Huang et al.), low-income cohorts (e.g., Kaniuka et al.), police officers (Hofmann et al.), and suicide prevention professionals (e.g., Roškar et al.). As Roškar et al. highlighted, even the professional knowledge of these suicide prevention professionals would not make them "immune" to mental illnesses. Ergo, mental health promotion and suicide prevention should be considered a global project, covering the welfare of a broad spectrum of populations.

WHAT are the risk factors for mental health issues and suicide attempts?

According to Dat et al. and Li, Zhan et al., people were more likely to be trapped by suicidal ideation if they labeled themselves as "unimportant," "unpromising," and "disconnected." Moreover, Li, Zhan et al. emphasized that "unimportant" is the central note linking adolescents' negative concepts of abuse, depression, and suicidal ideation.

Similarly, problematic drinking (Kaniuka et al.) and financial hardship (Mathieu et al.) could threaten self-esteem, decrease resilience, and increase mental health concerns. In contrast, self-esteem enhancement activities can be the "antidote" (Dat et al.; Rudd et al.). Some "antidotes" prescribed by the current researchers were empowerment-oriented intervention (Park et al.), self-efficacy promoting game playing (Li, Zheng et al.), and active coping strategy learning (Kaniuka et al.).

HOW did COVID-19 impact the public's mental wellness?

Researchers considered that suicidal behavior and ideation during COVID-19 might not be solely attributed to the pandemic *per se* (Mathieu et al.; Clapperton et al.). In contrast, researchers found that the spikes in helpline calls and in suicidal risks corresponded to the consequent events of the pandemic, such as lockdowns and economic recession (Mathieu et al.; Pavlova et al.). These consequent events might increase individuals' feelings of isolation and decrease their self-assurance when facing life problems (Mathieu et al.).

Moreover, COVID-19's impact on the suicide rate is also impacted by people's age, sex, culture, and other demographic characteristics. Clapperton et al. found that the suicide rate of young male Westerners (e.g., Australians) increased during the pandemic. Similarly, the demand for helpline services was enhanced among youth and cohorts with financial issues in Aotearoa/New Zealand (Pavlova et al.). In contrast, Ramesh et al. mentioned that antecedent factors for suicide during COVID-19 could be inconsistent for Indian males (i.e., due to financial issues, such as unemployment) and females (i.e., due to interpersonal and affective issues, such as domestic violence and depression). Referencing World Health Organization's report [(1), p. 10], the male/female sex ratio of suicide rates tended to be larger in Western (e.g., America and Russia) than in Asian countries (e.g., China and India). The above findings hinted at a "culture–sex interaction effect" on suicide, which is worth attention by future researchers.[1]

WHAT can we do now?

Researchers proposed that playing simple and manageable music video games could help youths with depression (Li, Zheng et al.). Similar activities may help people re-establish self-efficacy (Li, Zheng et al.). Self-efficacy and self-esteem, in turn, form a "bubble" protecting people from mental health issues (Dat et al.). In contrast, time-wasting electronic activities (e.g., excessive smartphone use) could induce self-blame and weaken the "bubble" (Huang et al.).

Meanwhile, telephone-based and messenger-based counseling services are necessary for mental health promotion, especially during the pandemic (e.g., Pavlova et al.). Notably, females were more likely to express their suicidal ideation and attempts (Kohls et al.), whereas the suicide rate of males was significantly higher (6). Shi et al. (6) discussed that males might conceal their mental vulnerability to protect their masculine pride; this caused their mental health issues to be underdiagnosed and undertreated. Similarly, researchers remarked that mental health promotion should be adapted to clients' cultures (e.g., the Māoris had a gradually decreased demand for helpline services during COVID-19; Pavlova et al.). Helpline workers and other psychological professionals should be aware of the above sex and cultural differences.

Furthermore, researchers pointed out that formal education about suicide prevention (Hofmann et al.), mental health stigma reduction (Roškar et al.), child protection (Li, Zhan et al.), and firearm safety plans (Rudd et al.) are all necessary for achieving the goal of mental health promotion and suicide prevention in our society. Moreover, these educational modules should be provided to high-risk populations, suicidologists, police officers, and other relevant professionals (Hofmann et al.; Park et al.; Roškar et al.). Finally, the current researchers also highlighted that social welfare (e.g., minimum wage and unemployment benefits) in tandem with emotional support from families and friends could be the last defense for people considering suicide (Mathieu et al.; Pavlova et al.; Huang et al.).

WHAT shall we consider for the future?

As reflected by this project, our current knowledge about suicidal ideation and behavior was mainly based on registered data and self-report studies. In contrast, the possible biomarkers of suicidal behavior and the neurological networks underpinning suicidal ideation were largely unknown. As Dat et al. stressed, every suicide could negatively affect 6–135 people [also see (7)]. A better understanding of the biomarkers and neurological networks would help us to predict people's suicide with higher accuracy and present more timely and solid suicide prevention and mental health support to those high-risk individuals and people around them.

Author contributions

QZ wrote the editorial.

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1 To date, researchers have observed the "culture–sex interaction effect" in studies of self-esteem (2), emotional processing (3), and interpersonal empathy (4, 5).

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Conflict of interest

The author declares 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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BRIEF RESEARCH REPORT
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Patterns of Suicide in the Context of COVID-19: Evidence From Three Australian States

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Aims: We aimed to determine whether there has been a change in the number of suicides occurring in three Australian states overall, and in age and sex subgroups, since the COVID-19 pandemic began, and to see if certain risk factors for suicide have become more prominent as likely underlying contributing factors for suicide.

Method: Using real-time data from three state-based suicide registers, we ran multiple unadjusted and adjusted interrupted time series analyses to see if trends in monthly suicide counts changed after the pandemic began and whether there had been an increase in suicides where relationship breakdown, financial stressors, unemployment and homelessness were recorded.

Results: Compared with the period before COVID-19, during the COVID-19 period there was no change in the number of suicides overall, or in any stratum-specific estimates except one. The exception was an increase in the number of young males who died by suicide in the COVID-19 period (adjusted RR 1.89 [95% CI 1.11–3.23]).
The unadjusted analysis showed significant differences in suicide in the context of unemployment and relationship breakdown during the COVID-19 compared to the pre-COVID-19 period. Analysis showed an increase in the number of suicides occurring in the context of unemployment in the COVID-19 period (unadjusted RR 1.53 [95% CI 1.18–1.96]). In contrast, there was a decrease in the number of suicides occurring in the context of relationship breakdown in the COVID-19 period (unadjusted RR 0.82 [95% CI 0.67–0.99]). However, no significant changes were identified when the models were adjusted for possible over-dispersion, seasonality and non-linear trend.

Conclusion: Although our analysis found no evidence of an overall increase in suicides after the pandemic began, the picture is complex. The identified increase in suicide in young men indicates that the impact of the pandemic is likely unevenly distributed across populations. The increase in suicides in the context of unemployment reinforces the vital need for mitigation measures during COVID-19, and for ongoing monitoring of suicide as the pandemic continues.

Keywords: mental health, suicide, COVID-19, epidemiology, risk factors

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has had damaging health, social and economic impacts across the world. In some countries the health impacts were predominately the large number of deaths directly resulting from COVID-19 (1). In countries like Australia, where COVID-19 cases and deaths have been fewer, the health impacts are likely due to the consequences of social distancing and stay-at-home orders (2). There has been considerable concern about the mental health of populations during this time, particularly concerns that suicides might increase as a consequence of the pandemic (3–5). The all-encompassing nature of the pandemic, and in particular, the stay-at-home orders designed to reduce the spread of COVID-19, may mean that people who already experience poor mental health may experience even worse outcomes, and others who have previously experienced good mental health may develop new mental health problems associated with the stress of the pandemic (4). In addition, people may be unable, or less likely to access mental health care, due to barriers associated with stay-at-home directives and general fear of contracting COVID-19. To date, most international and Australian based research has found no evidence of an overall increase in suicides in the initial months of the pandemic (6–8). However, experts have noted that we need to remain vigilant and that increases in suicide may still occur (2, 9). Recent findings from Japan suggest this caution is warranted; after an initial reduction in suicide in that country, there was a subsequent increase (10, 11).

In addition to monitoring overall trends in suicide as the pandemic continues, it is essential to consider whether patterns may vary for different subgroups in the population (9). Monitoring suicide numbers for different demographic subgroups (e.g., males and females in different age groups) is important. However, it is also important to track whether specific social determinants of suicide are increasingly implicated in suicides during the pandemic. The flow-on effects from the economic consequences of the pandemic such as financial problems, unemployment and homelessness are a major concern, given the global economic crisis of 2008 was associated with an increase in suicide in several countries (12). Another risk factor for suicide that the pandemic may heighten is relationship breakdown. Research suggests that couples who experience elevated stress, as is likely for many reasons during COVID-19, interact using less adaptive relationship processes and are therefore at greater risk for relationship deterioration (13).

In Australia, research from Queensland using the interim Queensland Suicide Register (iQSR) found no absolute or relative increases in four motives for suspected suicides, namely recent unemployment, financial problems, relationship breakdown, or domestic violence in the initial months of the pandemic (7). Similarly, a Victorian study using the Victorian Suicide Register (VSR), found no increase in the frequency of suicides following the onset of COVID-19. However, the study identified 60 instances of "COVID-linked suicides" (9.5% of the total suicides included in the study) (8). The current study complements these studies by pooling data from the iQSR, the VSR, and the Tasmanian Suicide Register (TSR), which typically account for nearly half of all suicides occurring annually in Australia.

The aims of this study were two-fold: (1) to determine whether there has been a change in the number of suicides occurring overall and in age and sex subgroups since the COVID-19 pandemic began; and (2) to determine whether particular risk factors for suicide (namely relationship breakdown, financial stressors, unemployment, and homelessness) have become more prominent as likely underlying contributing factors for suicide during the pandemic.

METHOD

Study Design

Using real-time suicide data from the iQSR, the VSR and the TSR that is largely drawn from police reports (see below), we ran multiple interrupted time-series analyses (ITSA) to ascertain whether trends in monthly suicide counts changed after the pandemic began and whether there had been an increase in suicides where relationship breakdown, financial stressors, unemployment and homelessness were recorded.

Data Sources and Inclusion Criteria

We pooled data from the iQSR, the VSR and the TSR for the period from 1st January 2017 to 31st August 2020. The fact that the data sources for this study are real-time registers means that the suicides registered within them are "suspected" based on coders' judgements (which in turn are based largely on initial police evidence) and not yet confirmed by the coroner.

Victorian Health Authorities confirmed the first case of COVID-19 in Australia on the 25th January 2020, and Queensland (and New South Wales) confirmed cases in the following days (13, 14). Therefore, we chose 1st February 2020 as the beginning date of our COVID-19 period and included data on suspected suicides occurring in the 37 months before (1st January 2017 to 31st January 2020) and the seven months after (1st February 2020–31st August 2020). Variables of interest were age group and sex of the deceased, the month of death, and evidence of relationship breakdown, financial stressor, unemployment or homelessness.

Interim Queensland Suicide Register (IQSR)

The sole data source for the iQSR is the Form 1 police report of a death to a coroner. These reports inform coroners of the circumstances of the death and characteristics of decedents, to assist forensic pathologists and coroners in determining the cause of death and potential intent of the deceased. The Form 1 police reports are completed by a police officer soon after a death, following an interview with the deceased's next-of-kin or other available people. The iQSR methodology is discussed in detail elsewhere (15). For this study we took the responses to the question "Is there any possible motive/trigger for the suicide?" and coded the presence of relationship breakdown, financial stressors and unemployment. We used the variable "residency" to code for evidence of homelessness.

Victorian Suicide Register (VSR)

The VSR includes the full text of the summary of circumstances that Victoria Police submit when initially reporting a death to the Coroners Court of Victoria. The summary of circumstances is an unstructured narrative prepared in the hours after the death or discovery of body and includes whatever relevant information the reporting police officer can ascertain based on attendance at the scene of death and speaking with witnesses. The detail and accuracy of information contained therein largely depends on what can be established at the time. Some summaries include extensive accounts of the events leading up to death recounted by family members, acquaintances and treating medical practitioners, and through suicide notes found at the scene. In other cases the summary of circumstances may be little more than a description of the scene of death. For this study, we coded the presence of the four risk factors of interest if there was any suggestion in the police summary that those factors may have been implicated in the suicide.

Tasmanian Suicide Register (TSR)

Notification of suspected suicides for the TSR is by the police report of death for the coroner. Police officers who first attend the death complete this report. It is based on a mix of structured items (e.g., date and time of death, socio-demographic information) and an additional unstructured narrative of police circumstances generated following interviews with witnesses or the senior next-of-kin or both. Suicides are classified using these initial interviews, any prior statements by the deceased to family friends, notes/letters outlining intent, and known previous suicide attempts. Each of these is recorded on the police report of death. To code the presence of stressors in each suicide, we used certain items on the police report, namely the presence of possible motives/triggers for the suicide (specifically relationship breakdown, financial problems and unemployment). We used the variable "residence status" to determine whether the individual was homeless.

Data Analysis

We combined data from the three registers into a single dataset that aggregated data at the monthly level for six different strata (men and women aged under 25 years, 25–64 years and 65 years and older). We used these data to estimate any change in the number of suicides during the pandemic compared with the period before the pandemic, as defined above.

We explored whether there was a change in the number of suicides per month in unadjusted and adjusted analyses. In our unadjusted analysis, we compared the average number of suicides per month in the pre-COVID-19 period (the number of suicides divided by the number of pre-COVID months) to the average number of suicides per month during the first months of the pandemic (calculated the same way as for the pre-pandemic period). We did this by calculating a rate ratio, defined as the ratio of these two averages. We did this for all suicides, for age-sex strata, and for the age-sex strata of the four different risk factors (i.e., relationship breakdown, unemployment, financial stressors, and homelessness).

In our adjusted analyses, we calculated the rate ratio using ITSA by fitting Poisson regression models to the monthly data. Our model included a binary variable for the pandemic (coded 0 in the pre-COVID-19 period and 1 during the pandemic), and non-linear terms for time, including seasonality. The ITS model was therefore:

$$\log\left(y_t\right) = \beta_0 + \beta_1 x_1 + f\left(time\right)$$

where x_1 was a binary coded variable equal to 1 if the observation is during the pandemic period and 0 otherwise, $f(time)$ was a function for time. The exponential of the parameter β_1 was interpreted as the rate ratio of interest (i.e., $e^{\beta_1} = RR$). The function for time comprised two components: long-term time trends (using fractional polynomials) and short-term trends (using Fourier terms, i.e., Sine and Cosine pairs). Overdispersion was addressed by using a scaling parameter set to the estimated Pearson chi square statistic divided by the residual degrees of

TABLE 1 | Counts of suspected suicides in each period (before and during COVID-19), by age group and sex.

	Total		Pre-COVID-19 (37 months)		COVID-19 (7 months)	
	n	% of all suicides	*n*	% of all suicides	*n*	% of all suicides
All	5,791	100.0	4,878	100.0	913	100.0
<25 years	833	14.4	685	14.0	148	16.2
25–64 years	4,080	70.5	3,461	71.0	619	67.8
65+ years	878	15.2	732	15.0	146	16.0
Males	4,366	75.4	3,676	75.4	690	75.6
<25 years	617	10.7	504	10.3	113	12.4
25–64 years	3,104	53.6	2,633	54.0	471	51.6
65+ years	645	11.1	539	11.0	106	11.6
Females	1,425	24.6	1,202	24.6	223	24.4
<25 years	216	3.7	181	3.7	35	3.8
25–64 years	976	16.9	828	17.0	148	16.2
65+ years	233	4.0	193	4.0	40	4.4

TABLE 2 | Counts of suspected suicides in each period (before and during COVID-19), by the presence of risk factors.

	Total		Pre-COVID-19 (37 months)		COVID-19 (7 months)	
	n	% of all suicides	*n*	% of all suicides	n	% of all suicides
RISK FACTORS						
Relationship breakdown	1,336	23.1	1,145	23.5	191	20.9
Financial stressors	442	7.6	369	7.6	73	8.0
Unemployment	361	6.2	280	5.7	81	8.9
Homelessness	90	1.6	75	1.5	15	1.6

freedom. Adjusted analyses were run for all suicides, for age-sex strata, and for the age-sex strata of the four different risk factors. We conducted all analyses using Stata software (version 16.0).

RESULTS

Over the entire study period there were 5,791 suicides recorded across Queensland, Victoria, and Tasmania (**Table 1**). Males accounted for 75.4% of these suicides ($n = 4{,}366$) and most occurred among people aged 25–64 years (70.5%, $n = 4{,}080$).

In the pre-COVID-19 period there were 4,878 suicides recorded, or an average of 132 suicides per month. In the COVID-19 period there were 913 suicides recorded, or an average of 130 per month. Males accounted for approximately three-quarters of suicides in both the pre-COVID-19 period and the COVID-19 period (75.4 and 75.6%, respectively). People aged 25–64 years accounted for 70.5% of suicides overall, 71.0% in the pre-COVID-19 period and 67.8% in the COVID-19 period.

Of the four risk factors for suicide examined in this study, relationship breakdown was the most frequently recorded by the police (**Table 2**). There were 1,336 cases of suicide for which relationship breakdown was recorded, 23.5% in the pre-COVID-19 period and 20.9% of cases in the COVID-19 period. There were 442 cases of suicide for which the presence of financial stressors was recorded (7.6% in the pre-COVID-19 period and 8.0% in the COVID-19 period), 361 for which unemployment was recorded (5.7% in the pre-COVID-19 period and 8.9% in the COVID-19 period), and 90 for which homelessness was recorded (1.5% in the pre-COVID-19 period and 1.6% in the COVID-19 period).

Changes Over Time

Table 3 shows the observed number of suicides in the pre-COVID-19 period and the COVID-19 period, the mean number of suicides per month in each period, and the unadjusted and adjusted rate ratios (RRs). Compared with the pre-COVID-19 period, during the COVID-19 period there was no change in the number of suicides overall (unadjusted RR 0.99 [95% CI 0.92–1.06]; adjusted RR 1.10 [95% CI 0.93–1.32]), or in any stratum-specific estimates except one. The exception was an increase in the number of young males dying by suicide in the COVID-19 period in the adjusted model (adjusted RR 1.89 [95% CI 1.11–3.23]).

Considering risk factors, the unadjusted analysis showed significant differences in suicide in the context of unemployment and relationship breakdown during the COVID-19 period compared to the pre-COVID-19 period. Analysis showed an increase in the number of suicides occurring in the context of unemployment in the COVID-19 period (unadjusted RR 1.53 [95% CI 1.18–1.96]). Specifically, there were increases in suicides in which unemployment was implicated in males (unadjusted RR 1.58 [95% CI 1.20–2.07]) and in males aged 25–64 years (unadjusted RR 1.53 [95% CI 1.12–2.05]). In contrast, there was a decrease in the number of suicides occurring in the context of relationship breakdown in the COVID-19 period (unadjusted RR 0.82 [95% CI 0.67–0.99]). However, no significant changes related to risk factors remained after adjusting the models.

DISCUSSION

Through analysis of real-time suicide surveillance data in Queensland, Victorian and Tasmania, we found no overall increase in suicides in the initial seven months of the pandemic compared to the pre-COVID-19 period. However, we identified an increase in suicides in young males. Additionally, unemployment was a stressor implicated in more suicides occurring during the COVID-19 period compared to the pre-COVID-19 period; this was accounted for by an increase in these cases in males aged 25–64 years. There was no increase in unemployment-related suicides in young males despite this age group showing an overall increase in the number of suicides over the initial months of the pandemic. We also identified a small decrease in suicides in men aged 25–64 years occurring in the context of relationship breakdown. Although these changes in suicides in the context of unemployment and relationship breakdown were identified in our unadjusted analysis, no significant changes were identified in our adjusted analysis. As such, we have only low to moderate confidence in these findings since they were not adjusted for typical confounding variables in time series analyses. The finding we have the most confidence in is the significant increase in suicides in young males in the first 7 months of the COVID-19 pandemic.

TABLE 3 | Unadjusted and adjusted rate ratios of suspected suicides in the COVID-19 period based on the trends in the pre-COVID-19 period.

	Number of suicides		Mean suicides (per month)		Unadjusted rate ratio	Adjusted rate ratio
	Pre-COVID-19 (37 months)	COVID-19 (7 months)	Pre-COVID-19	COVID-19	RR (CI)	RR (CI)
All	4,878	913	131.84	130.43	0.99 (0.92, 1.06)	1.10 (0.93, 1.32)
Males	3,676	690	99.35	98.57	0.99 (0.91, 1.08)	1.12 (0.90, 1.41)
<25 years	504	113	13.62	16.14	1.19 (0.96, 1.46)	1.89 (1.11, 3.23)**
25–64 years	2,633	471	71.16	67.29	0.95 (0.86, 1.04)	1.01 (0.83, 1.22)
65+ years	539	106	14.57	15.14	1.04 (0.84, 1.28)	0.93 (0.67, 1.30)
Females	1,202	223	32.49	31.86	0.98 (0.85, 1.13)	0.94 (0.80, 1.10)
<25 years	181	35	4.89	5.00	1.02 (0.69, 1.47)	1.50 (0.69, 3.26)
25–64 years	828	148	22.38	21.14	0.94 (0.79, 1.13)	0.95 (0.74, 1.20)
65+ years	193	40	5.22	5.71	1.10 (0.76, 1.55)	0.74 (0.44, 1.24)
RELATIONSHIP BREAKDOWN						
All	1,145	191	30.95	27.29	0.88 (0.75, 1.03)	0.97 (0.78, 1.19)
Males	923	152	24.95	21.71	0.87 (0.73, 1.03)	0.84 (0.57, 1.25)
<25 years	104	23	2.81	3.29	1.17 (0.71, 1.85)	2.24 (0.85, 5.90)
25–64 years	758	118	20.49	16.86	0.82 (0.67, 0.99)**	0.78 (0.48, 1.25)
65+ years	61	11	1.65	1.57	0.95 (0.45, 1.83)	0.31 (0.05, 1.84)
Females	222	39	6.00	5.57	0.93 (0.64, 1.31)	0.80 (0.56, 1.16)
<25 years	46	7	1.24	1.00	0.80 (0.31, 1.79)	2.09 (0.35, 12.41)
25–64 years	160	31	4.32	4.43	1.02 (0.67, 1.51)	0.90 (0.55, 1.47)
65+ years	16	<5	0.43	a	0.33 (0.01, 2.13)	0.49 (0.02, 12.62)
FINANCIAL STRESSORS						
All	369	73	9.97	10.43	1.05 (0.80, 1.35)	1.43 (0.77, 2.64)
Males	312	66	8.43	9.43	1.12 (0.84, 1.46)	1.36 (0.76, 2.45)
<25 years	19	6	0.51	0.86	1.67 (0.55, 4.35)	3.27 (0.93, 11.45)
25–64 years	265	51	7.16	7.29	1.02 (0.74, 1.38)	1.37 (0.73, 2.58)
65+ years	28	9	0.76	1.29	1.70 (0.71, 3.70)	2.88 (0.98, 8.44)
Females	57	7	1.54	1.00	0.65 (0.25, 1.43)	1.95 (0.24, 15.97)
<25 years	<5	0	a	0.00	0 (0, 28.14)	b
25–64 years	48	6	1.30	0.86	0.66 (0.23, 1.55)	2.51 (0.28, 22.39)
65+ years	7	<5	0.19	a	0.76 (0.02, 5.88)	1.52 (0.10, 22.65)
UNEMPLOYMENT						
All	280	81	7.57	11.57	1.53 (1.18, 1.96)**	1.26 (0.70, 2.26)
Males	237	71	6.41	10.14	1.58 (1.20, 2.07)**	1.16 (0.63, 2.12)
<25 years	25	9	0.68	1.29	1.90 (0.78, 4.21)	1.68 (0.35, 7.99)
25–64 years	204	59	5.51	8.43	1.53 (1.12, 2.05)**	1.07 (0.52, 2.21)
65+ years	8	<5	0.22	a	1.98 (0.34, 8.26)	0.74 (0.18, 3.06)
Females	43	10	1.16	1.43	1.23 (0.55, 2.48)	1.42 (0.57, 3.55)
<25 years	<5	0	a	0.00	0 (0, 28.14)	b
25–64 years	39	10	1.05	1.43	1.36 (0.6, 2.76)	1.58 (0.61, 4.07)
65+ years	<5	0	a	0.00	0 (0, 28.14)	b
HOMELESSNESS						
All	75	15	2.03	2.14	1.06 (0.56, 1.86)	0.54 (0.29, 1.01)
Males	61	13	1.65	1.86	1.13 (0.57, 2.07)	0.57 (0.28, 1.16)
<25 years	<5	<5	a	a	3.52 (0.29, 30.76)	b
25–64 years	52	11	1.41	1.57	1.12 (0.53, 2.17)	0.52 (0.24, 1.13)
65+ years	6	0	0.16	0.00	0 (0, 4.49)	b
Females	14	<5	0.38	a	0.76 (0.08, 3.29)	0.43 (0.08, 2.27)
<25 years	<5	<5	a	a	2.64 (0.04, 50.77)	b
25–64 years	10	0	0.27	0.00	0 (0, 2.36)	b
65+ years	<5	<5	a	a	2.64 (0.04, 50.77)	b

*a, not shown due to low cell count; b, model could not be fitted to the data. **P < 0.05.*

Our finding of no overall increase in suicides is consistent with those of other published studies from high-income and upper-middle-income countries, which have found either decreases or no changes in suicide rates over the early months of the pandemic (6–8, 16–18). The largest of these studies analyzed data from 21 countries (including all three data sources used in our study) and found no evidence of a significant increase in suicide rates since the beginning of the pandemic to the end of July 2020 (6). The circumstances the pandemic created could have had positive impacts on mental health, especially in the initial months of the pandemic (6, 19). It is therefore possible that some positive impacts of COVID-19 may have balanced or served as protective against the expected negative impacts and could at least partially explain why we did not find an overall increase in suicides in the early months of the pandemic.

Given these previous studies, it is unsurprising that we found no overall increase in suicides in the initial months of the pandemic. However, pooling data from three registers enabled stratified analyses by sex and age group and identified a significant increase in suicides in males aged younger than 25 years. There is considerable research regarding adverse outcomes associated with the pandemic that suggests young people are disproportionately affected (20, 21). A recent study of suicide rates found that effects of the pandemic were unevenly distributed across populations in Japan (10). Although the greatest increases in suicides in Japan were observed in females rather than in males, as we found, significant increases were also identified in people aged younger than 20 years (10). Young males warrant special consideration as a group that may be particularly adversely affected by the pandemic. We know that rates of suicide in this group are already high (22), and that certain factors may contribute to their over-representation in suicide statistics. For example, compared with their female counterparts, males are more likely to choose lethal means (23), more likely to use drugs and alcohol (24), and less likely to seek help (24). These factors, combined with the enormity of the mental health and economic impacts of COVID-19, may mean that the pandemic has particularly affected young males.

Despite young males being the only age group to show an overall increase in suicides, we could not directly ascertain whether any of the four risk factors appeared to be contributing to this increase. However, a few findings from our adjusted analysis may give us a clue as to what might be driving this increase in young men. After adjustment for confounding, we observed large rate ratios for young men in the context of relationship breakdown and financial difficulties (RR = 2.24 and 3.27, respectively). These rate ratios, however, were non-significant, and this is likely due to a lack of statistical power. If data were available for the whole country, or for a more extended period, it is conceivable that these findings would be statistically significant.

It is also possible that other risk factors contributed to the observed increase in suicides in young men. It was beyond the scope of this study to investigate all potential risk factors that might have been heightened by the pandemic, although young people might have been particularly affected by measures that were necessarily introduced to reduce the spread of COVID-19 such as lockdowns. These measures have increased isolation (4), a known risk factor for suicide (25). In addition, young people's educational experiences have been greatly impacted during the pandemic and uncertainty about future employment is likely given the current circumstances. Continued monitoring of the overall number of suicides and risk factors associated with suicides in young men is essential.

We found some evidence of an increase in the number of suicides occurring in the context of unemployment, largely accounted for by an increase in these suicides in males aged 25–64 years. This is consistent with research that showed increases in suicide rates in most countries that were affected by the 2008 Global Economic Crisis, particularly for men affected by unemployment (12). The identified increase in unemployment-related suicides in our study occurred in the early months of the pandemic despite the introduction or strengthening of financial supports. The Australian Government funded initiatives (e.g., JobKeeper and JobSeeker) sought to buffer the effects of unemployment and underemployment as a result of the pandemic (5). Early results from the "Taking the Pulse of the Nation" survey of 1,200 adults suggest that following these government initiatives, self-reported financial stress fell to 20% (from 25% in early months of the pandemic) and remained steady during June and July 2020 (5). However, in the second half of 2020, with the announcement of plans to reduce support, financial stress increased even though the economy was starting to re-open (5). It will be critical to continue to monitor the impact of unemployment and financial stressors on suicide, especially as these government supports are scaled back.

In contrast to expectations, we found a slight decrease in suicides in men aged 25–64 years occurring in the context of relationship breakdown. It is possible that some relationships may have strengthened because couples and families spent more time together, which could protect against suicide. For others, relationship difficulties may have been significant and even exacerbated pre-existing difficulties, but couples may have been unable to separate (especially in areas that had protracted lockdowns) which may have artificially masked relationship breakdowns. There is some evidence of a decrease in divorce rates in the US during the early months of the pandemic but in some states initial declines have now rebounded (26).

Implications

Continued monitoring of suicide data is essential, particularly in the context of roll-backs of financial supports and implementation of further lockdowns. This monitoring should stratify by key demographic subgroups, and should also continue to consider risk factors such as unemployment. This monitoring is especially crucial given that in the Australian context there is some evidence that after initial reductions in emergency mental health-related ambulance call-outs and presentations to emergency departments (27–29), increases have occurred in the later months of the pandemic (29). Ideally, patterns of suicide in different geographical areas and different populations could be examined, not only at the state level but in smaller geographical regions and in populations that may be disproportionately affected by the impacts of the pandemic. It was beyond the scope of this analysis to consider external factors that might have influenced suicide patterns in different states, including varying

public health measures or economic support packages, but this could also be an area for future research.

While we found no significant increase in the number of suicides occurring in the context of financial or relationships stressors during COVID-19, Queensland (7) and Victorian (8) research has explored the COVID-19 context in individual suicides. One consistent finding was that financial situations and interpersonal relationships were notable domains in which stress manifested in suicides that were considered COVID-19 related. This suggests that, even if COVID-19 did not significantly affect the prevalence of these stressors, it may impact how individuals experience these stressors, which may be a valuable area for further exploration.

Qualitative research, particularly with people with lived experiences of suicide, is essential to understand the stories behind the statistics presented in this study. The increase in suicides in young males is worrying and given none of the stressors we studied appeared to be more commonly reported by police in suicides by this group during the pandemic, further research focusing on young males is essential.

Strengths and Limitations

This study had several strengths. Firstly, we combined data from Queensland, Victoria and Tasmania, enabling us to include approximately half of all Australian suicides that would have occurred over the study period. In addition, using this register data allowed us to examine trends in a way that would not have been possible had we relied on official suicide statistics. The data we drew upon are being produced in near real-time in these three states, and other states have or are also now establishing similar registers. This creates the opportunity to extend the analysis into the present and produce "rolling updates" on the themes and issues identified here.

Against this, the study also had several limitations. One limitation is the reliance on information provided by police. In Queensland and Tasmania, the standardized police forms used for this study were completed by a police officer soon after death, and in Victoria we used the information from the initial police summary of circumstances. The police summaries of circumstances vary greatly in detail, and the reliance on information supplied by police very soon after the death in all data sources, introduces the possibility of misclassification bias, like underreporting risk factors. In contrast, most previous research using the suicide registers used data contained in the full suicide registers. In Victoria for example, this means the entire coronial file including the coronial brief, forensic medical and scientific reports (i.e., autopsy and toxicology reports), and coroners' findings are typically available to coders (30). The presence of recent relationship breakdown reported in our study is largely consistent with research published using the full suicide registers in Victoria (31) and Queensland (32). However, the presence of other risk factors such as unemployment and financial related stressors is lower in this study compared to another Victorian study (33). Another related limitation is that we could only examine risk factors consistently captured across the three suicide registers and that could be reasonably expected to be recorded by the police (i.e., known about at the time of initial police investigations). In addition, the number of monthly suicides was often low, meaning that small changes could result in large rate ratios, even though the absolute change was small. Our study may be underpowered because statistical power in this context is largely a function of the number of time points available for analysis, with optimal power achieved when there are large numbers of time points in the periods of interest. Our study had seven months available for analysis for the COVID-19 period and 37 from the pre-COVID period. However, the need to use data with high statistical power must be balanced against the broader need to identify trends that signify worsening mental health conditions and, therefore an increased suicide risk.

CONCLUSION

Our findings reinforce the importance of proactive responses to the mental health and economic consequences of the pandemic. Although our analysis found no evidence of an overall increase in suicides after the pandemic began, the picture is complex. The identified increase in suicide in young men indicates that the impact of the pandemic is likely unevenly distributed across populations. The increase in suicides in the context of unemployment reinforces the strong need for mitigation measures during COVID-19, and for ongoing monitoring of suicide as the pandemic continues.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because of data confidentiality agreements. Requests to access the datasets should be directed to Angela Clapperton, angela.clapperton@unimelb.edu.au.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Melbourne's Human Research Ethics Committee (Reference Number: 2021-21322-16795-3). 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

JP, JD, KK, SL, AG, AC, and MS designed the study. JD, AG, KK, SL, and CM collected the data. AC and MS analyzed the data. AC wrote the first draft of the manuscript. All authors contributed to the interpretation of the findings and reviewed and revised drafts of the manuscript.

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An Evaluation of a Suicide Prevention E-Learning Program for Police Officers (COPS): Improvement in Knowledge and Competence

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Background: Police officers are at high risk for mental and physical health problems and suicidal ideation. The specific risk factors are numerous and concern stressful missions and administrative aspects of the police profession. So far, the police get only little training on specific missions as well as on coping with stress and suicidal ideation in the police profession. In this study we test the efficacy of the online training COPS (Coping with Suicide) for police officers.

Methods: A total of 142 police officers from Germany and Switzerland participated in the study; complete data (baseline and post) are available from 102 participants. The training consisted of three modules covering the topics of delivering death notifications, dealing with individuals with suicidal ideation and dealing with one's own distress and suicidal ideation in the police profession. The primary outcomes are perceived knowledge and self-rated competence regarding the contents of the program, actual knowledge as well as symptoms of depression and anxiety (PHQ-9), and attitudes toward suicide (ATTS). The data are collected at baseline and after completing the training.

Results: We found a significant increase in knowledge as well as in perceived competence after completing the training. Mental health and attitudes toward suicide did not change significantly. Years on the job had no moderating effect on the effectiveness of the training.

Discussion: The results suggest that a short e-learning program significantly improves knowledge and self-rated competence in delivering death notifications, in suicide prevention and stress management. It can be easily integrated into the daily routine of police-officers, and participants could participate at their own pace and from any location. One limitation of this study is the lack of a control-group. Further advantages and limitations of this study are discussed.

Clinical Trial Registration: https://www.drks.de/drks_web/, identifier: DRKS00023882.

Keywords: suicide prevention, mental health, police, death notifications, online training (e-learning)

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INTRODUCTION

The police profession is associated with numerous challenges that can have a significant impact on mental and physical health. Several empirical studies show that a high percentage of police officers suffer from mental disorders such as depression, PTSD and substance use disorders (1, 2). In addition, the suicide rate among police officers is higher compared to the general population (3). Physical complaints, such as a high risk of cardiovascular diseases and sleep disorders, are also problems many police officers deal with (4, 5). Such physical and mental health conditions often lead to temporary or permanent periods of inability to work and early retirement (6, 7).

Among the most frequently reported stress factors in the police profession are overwork and shift work, which can have negative effects on the circadian rhythm (4, 8). Further, particular police missions are also repeatedly mentioned as stressors. These include, for example, delivering death notifications, accidents, confrontation with death and the accumulation of these stressful tasks. In addition, there is also the population's increasing tendency toward violence, low social acknowledgment, as well as attacks and insults (1, 9). At the same time, police officers also report that there is often a lack of adequate training for difficult missions, such as delivering death notifications or handling individuals dealing with suicidal behavior. Aftercare is rarely offered after these kinds of potentially traumatic situations, which can also lead to poor mental health. The lack of training opportunities can cause insecurity in the respective situations, and inadequate aftercare causes an increased stress level (10). In parallel, the behavior of the police impacts the well-being of people they deal with during the missions, and inappropriate behavior can lead to the development of psychopathological symptoms in those individuals (11, 12). This also makes it essential to improve the conditions and training opportunities within the police force.

This study focuses on evaluating training to deal with persons with suicidal ideation, to cope with one's own stress and suicidal ideation in the police profession as well as the delivery of death notifications. These topics proved to be the most important and relevant in discussions with the affected group of people.

Police officers have many opportunities for contact with individuals with increased suicide risk: e.g., when people have lost a loved one and become suicidal in response or when the police is called to an individual shortly before a suicide attempt. Therefore, it is highly relevant that police officers should recognize the precursors of suicidal behavior and should be able to assess the severity of suicidal behavior. Most importantly, they should be sufficiently trained in communicating with persons experiencing this specific state in order to be able to react adequately and prevent suicides, if possible.

Although police officers belong to the group of people who frequently come into contact with suicidal behavior, they are not necessarily part of the target group when it comes to gatekeeper training for suicide prevention. This, in turn, often leads to insufficient expertise in this field (10). In addition, studies show that stigmatization and prejudices regarding suicidal behavior and mental disorders are still widespread in the police profession (13, 14). There is now a number of programs with training specifically for police officers in the area of suicide prevention that have shown satisfactory results in the effectiveness of such trainings (10, 15, 16). Those who participated showed a lower stigmatizing attitude toward suicidal behavior, increased knowledge and an increase in self-rated competence in dealing with persons with suicidal ideation. In addition, the individuals with gatekeeper training are more likely to recognize warning signs (16).

These results show that gatekeeper training is quite effective for suicide prevention and that this topic should be more relevant in the police profession.

Police officers are at high risk for mental disorders and suicides. Studies show that the risk of suicide is twice or even three times higher than in the general population in the US (17). As mentioned, police officers are exposed to many distressing factors. In addition, the police profession is still male-dominated, and men generally have a higher risk of suicide than women (18). Moreover, there is easy access to weapons. In their recent systematic review, Syed et al. (2) found a 14.6% prevalence for depression, 14.2% for PTSD, 8.5% for suicidal ideation, and a 25.7% prevalence for hazardous drinking. Stress at the workplace and shift work also have an impact on private life; hence increased social isolation is common, including poor quality relationships with children and partners and also higher divorce rates (19, 20).

One of the major problems among police officers is the low willingness to seek help (21). This is caused by several factors. Mental disorders among the police are still highly stigmatized, and police officers fear bullying among colleagues (22). Absenteeism due to mental health problems is often declared as a weakness, especially among male colleagues. Although specific psychosocial support is already available in many police departments, it is often not used fearing compromised confidentiality (22). Within the police profession, there are generally few opportunities for promotion and career development. For this reason, some worry that getting support may affect this as well. However, external support (e.g., counseling) and internal police support (23) are both avoided. There are often misconceptions about the effects and consequences of psychotherapy (e.g., negative effects on the insurance status).

In sum, there is an urgent need to provide knowledge about support services, to address stigma and to highlight the relevance of mental health. Furthermore, creating low-threshold and possibly anonymous online-based support services is advised in order to offer initial support.

Delivering death notifications is one of the most disliked tasks in the police profession, which many police officers would rather avoid. Delivering a death notification can have a lasting impact not only on the bereaved relatives, but also on the persons delivering the message, such as the police officers (24–26). Studies have shown that in the aftermath the persons delivering the messages often suffer from sadness, insomnia, feelings of helplessness, fear, and guilt (27). Police officers reported great insecurity in dealing with bereaved people, especially when the bereaved people react very emotionally in this situation.

Additionally, police officers are challenged with delivering the message as adequately and empathetically as possible, but at the same time addressing issues relevant to a possible investigation. This often leads to avoidant behavior of the police, which in turn leads to an incorrect delivery of the death notification (12). It is still not uncommon that the message is delivered at the doorstep or even on the phone, or the officers leave the situation as soon as possible after the delivery and do not provide any aftercare for the bereaved (12).

The way a death notification is delivered can impact the mental health and grieving process of the bereaved significantly. An insufficient delivery of the message can clearly lead to PTSD, depression and prolonged grief, as well as to suicidal ideation and increased mortality among the bereaved (11, 12, 28).

Especially when a person has died by suicide, delivering death notifications is even more challenging. Often lacking training on appropriate interaction with this specific group of bereaved leads to growing insecurity in dealing with them (26). Furthermore, one's own attitude as well as personal experience and one's own possible prejudice when delivering the message play an important role. In addition, individuals bereaved by suicide are particularly at risk for mental disorders and increased suicidal ideation (29). This further highlights the relevance of focusing on the way the death notification is delivered to this group.

Despite the far-reaching consequences on both sides in this situation, the people delivering the message repeatedly report lacking education and training in this field (27). In order to best control the negative consequences of this situation for both sides and to keep the process running smoothly, regular training and case work is therefore strongly recommended.

Numerous interventions train in delivering death notifications among different professions (30, 31). Most of these programs have shown greatly increased knowledge; participants feel more competent and better prepared for this situation and report a deeper understanding of the procedure. However, most of these training programs are aimed at doctors, nurses or medical students. To our knowledge, there is little evaluated (online) training specifically aimed at the police.

Aims and Hypotheses

The main objective of this study is to increase knowledge and self-rated competence regarding suicide prevention. This includes dealing with persons with suicidal ideation, recognizing suicidal tendencies, acting adequately in acute risk situations as well as improving communication skills. Furthermore, the training should improve the ability to deal with one's own mental health distress and possible suicidal ideation. We expected stigmatizing attitudes toward suicidality and symptoms of depression and anxiety to decrease after completing the intervention. In addition, the study aimed to increase knowledge and competence in delivering death notifications. This includes how to deliver messages correctly, how to communicate with the bereaved, and how to support those who are grieving.

Finally, the study aimed to evaluate the roles of age, gender, years in the profession, and knowledge as well as attitudes toward suicide regarding police officer's self-reported competence of suicide prevention, mental health, and delivering death notifications.

METHODS

Trial Design

This study was a quasi-experimental study. After registration, participants completed a baseline measure and immediately entered the online training and had access to it for three weeks. After completion, participants were asked to take the post-measurement. Three months after the post-measure, participants were sent a follow-up questionnaire.

The study has been approved by the Ethics Committee of the Medical School Berlin (registration number MSB-2020/27) on March 30th, 2020.

Study Setting and Recruitment

Recruitment took place in Germany and Switzerland. To achieve the largest possible sample, the study cooperated with the police in Berlin, Germany and also with the police in Basel, Switzerland. They integrated the program into their own training courses and supported the data collection by providing computers and working time for the training. Recruitment was also carried out via social networks (e.g., Facebook, Instagram) as well as via police-specific forums and magazines. In addition, recruitment took place via police pastoral care and the police union.

Eligibility Criteria and Sample Size

The following criteria must be met for participation: (1) working as a police officer, being in training to become a police officer or studying at a police academy, (2) aged between 18 and 67 (retirement age), (3) sufficient German language skills, and (4) having access to the internet. Participants must also submit a signed consent form in order to participate in the training.

There are relatively few studies using online trainings exclusively for the police. We based the sample size and power estimations on results from previous studies examining the effectiveness of online gatekeeper trainings, which focus on topics similar to our training (e.g., suicide prevention) (32). Assuming a between-subject effect size of $d = 0.80$, power of 0.80, alpha of 0.05 (two sided), and a dropout rate of 40%, the sample size should be at least 100 participants. 142 participants enrolled in the study and 102 participants completed the post measurement.

Measures

All questionnaires contained measures to assess the following outcomes: demographic variables, an assessment of one's own competence related to the trainings modules, perceived knowledge and competence, attitudes toward suicide and symptoms of depression and anxiety. The post-tests contained additional subjective ratings on the usefulness of the training. The whole questionnaire can be seen in the **Supplemental Material**.

Demographic Variables

We assessed the following parameters for personal information: age, marital status, level of education, year of graduation as a police officer, years of service, current police department and current country they work in. Participants were also asked if

they frequently deliver death notifications, how often they did so, if they have been offered any professional support (e.g., psychotherapy) at the moment.

Perceived Knowledge and Competence

This questionnaire assesses the participants' perceived knowledge and their own perceived competences on the following subscales: *competence in delivering death notifications* (five items, e.g., "I feel confident in delivering the news of death.", $\alpha = 0.81$), *competence in suicide prevention* (seven items, e.g. "When a person expresses suicidal thoughts, I do not know how to proceed.", $\alpha = 0.84$), and *competence in managing one's own mental health* (five items, e.g. "I can realistically assess my own psychological stress.", $\alpha = 0.49$). The questionnaire consists of 17 items rated on a 6-point Likert scale ("strongly disagree"; "strongly agree") with higher scores indicating high subjectively perceived competence. A total score can be calculated as well as individual sum scores for each of the three subscales. This questionnaire was designed specifically for this study, and validation is expected.

Actual Knowledge

This questionnaire assesses the actual knowledge of the participants based on the training content. The questionnaire consists of 24 items, of which 20 questions have a multiple-choice answer format ("Which group is considered a high-risk group for suicides?") and four items have an open answer format "Name three risk factors for suicide."). In the multiple-choice answers, one or more answers may be correct. The higher the total score, the higher the knowledge of the respective person. The participants' answers were evaluated and, if correct, scored with one point per correct answer. This questionnaire was newly developed specifically for this study, as it covered the learning topics of the modules (see **Supplementary Material**).

Short Version of the Patient Health Questionnaire (PHQ-9)

The German version of the PHQ-9 (33) is a screening tool aimed at assessing depression (nine items, 4-point rating scale from "not at all" to "almost every day"), anxiety (five items, yes/no) and functional impairment (one item, 4-point rating scale from "not at all impaired" to "strongly impaired"). The PHQ-9 has shown a good internal consistency of $\alpha = 0.89$ in a clinical sample (33) and of $\alpha = 0.80$ in this sample. Higher scores indicate high symptom severity in the respective outcomes.

Questionnaire on Attitudes Towards Suicide

The ATTS (Renberg et al., 2003) assesses attitudes toward suicide in the general population as well as the link between those attitudes and suicidal behavior. The questionnaire originally consists of 40 items on a 5-point Likert scale (1 = "strongly agree," 5 = "strongly disagree"). In this study we adopted the 10-factor model suggested by the authors using 34 items and excluding six items. The internal consistency for the whole instrument was $\alpha = 0.60$ in a healthy Swedish sample (34) and $\alpha = 0.61$ in this sample. Six factors showed an internal consistency under $\alpha = 0.50$ and were excluded from further analyses. The included factors were as follows: suicide as a right ($\alpha = 0.76$) incomprehensibility ($\alpha = 0.53$), non-communication ($\alpha = 0.55$), and normal-common ($\alpha = 0.51$). In the original study, the internal consistency for the factors varied between $\alpha = 0.38$ to $\alpha = 0.86$.

Perceived Usefulness of the Training

On the basis of a total of 18 items, the perceived usefulness of the training after completion is assessed. Fifteen of these items are answered on a 6-point Likert scale ("strongly disagree," "strongly agree"). The questions relate on the one hand to the content of the training ("I now feel safer and more prepared when dealing with individuals with suicidal ideation") as well as to the design and user-friendliness ("I found the online training to be very well designed."). The remaining three items are open-ended questions assessing positive as well as negative aspects of the training and suggestions for improvement. The internal consistency for the whole instrument in this study was $\alpha = 0.75$. This questionnaire (see **Supplementary Material**) was developed specifically for this study and has not been validated before.

Procedure

The flowchart is shown in **Figure 1**. Interested participants could learn more about the online training on our website (www.cops-praevention.de). The website is still active and is updated regularly. In case of further questions, participants could contact the project coordination at any time. The website has information on the study and on support services, both general and specific for the police.

Participants were requested to register on the website. For this they had to provide their first and last name, a username and e-mail address. They also needed an individual password. After registration, participants received an e-mail with a link to an online survey (baseline) as well as participant information and a consent form for participation. These documents were also provided again as part of the online survey and could be downloaded there. On the first page of the survey, the participants were asked to give their digital consent to participate in the study after reading the participant information. If the participants agreed, they were redirected to the questionnaires. Completing the questionnaire took about 20–25 min and could be interrupted and re-continued or canceled at any time.

After completing the questionnaire, participants were sent technical instructions and the password for using the online training, and they could start the training immediately. Access was valid for three weeks, during which participants should have completed the training. After three weeks the participants were invited to complete the online post-test survey. Once they had completed the questionnaire, participants received an official certificate of participation in the training. Three months after participation, participants were sent a link to the follow-up questionnaire. If participants did not complete the post or follow-up questionnaire, they were reminded again by mail two and four weeks later, respectively.

Confidentiality

Participants registered with full name and email address. This information was only accessible to the project coordinator and was needed to assign the participants to the program and

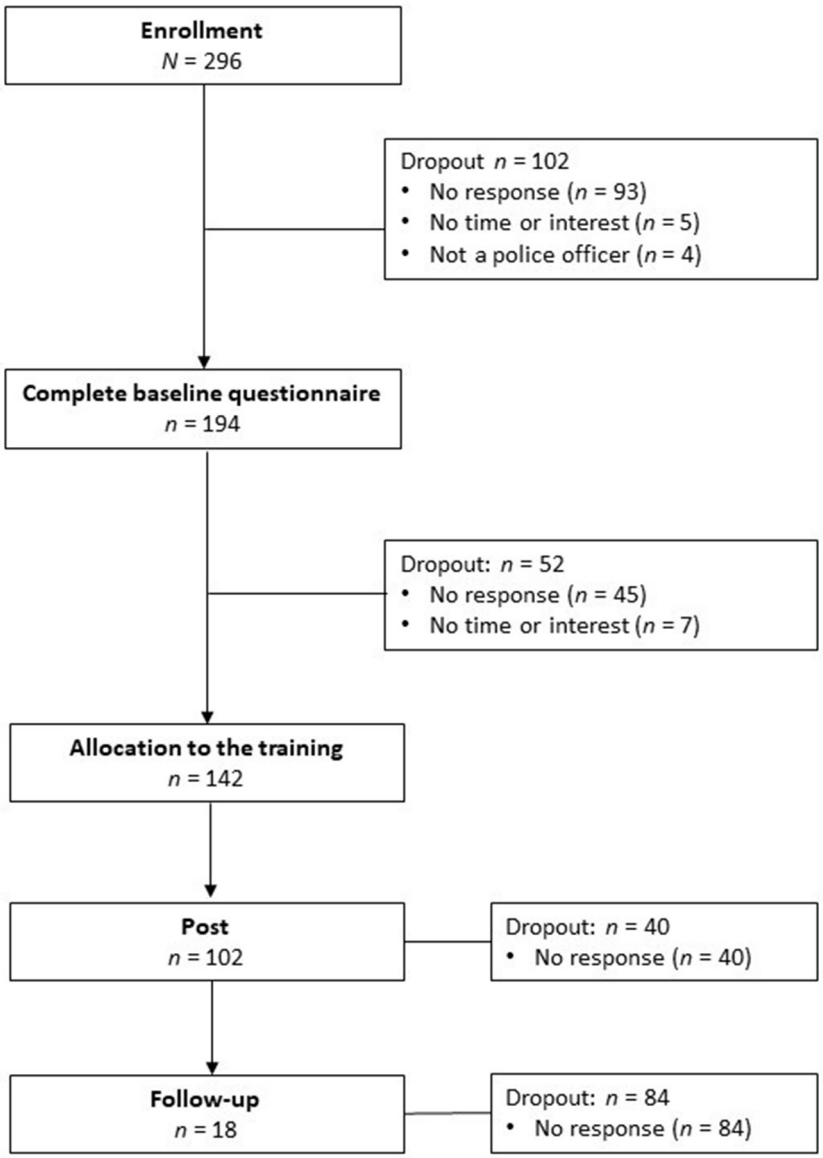

FIGURE 1 | Flowchart of participants.

to contact them. Logging in to the program required a user name and password. After initial login, participants could reset their username and password. To complete the questionnaires, participants generated a 5-digit code. The collected data were stored under this code. A coding list existed in printed form, which contained the code as well as the name and mail address of the participants and made it possible to assign the codes to the persons. This list was kept in a safe locked cabinet at the Medical School Berlin and was only accessible to the project coordinator. This list was destroyed after the end of the study. Participants were informed that they can request their data be deleted as long as the list exists. After that, it is no longer possible to assign the codes to the names.

The E-Learning Program

To develop the program, the first author attended police training courses for assessing the needs of police officers. In these seminars the officers were asked what kind of information and content would interest them in a suicide prevention program. Further, they were invited to communicate which situations and circumstances they find most difficult in the police profession. In addition, various professionals were contacted who are familiar with the police (e.g., professors, pastoral care for the police) to include their perspective and their suggestions in the development of the modules. A short online survey was developed to assess the use of support services, aftercare and training opportunities within police stations, and the stress level

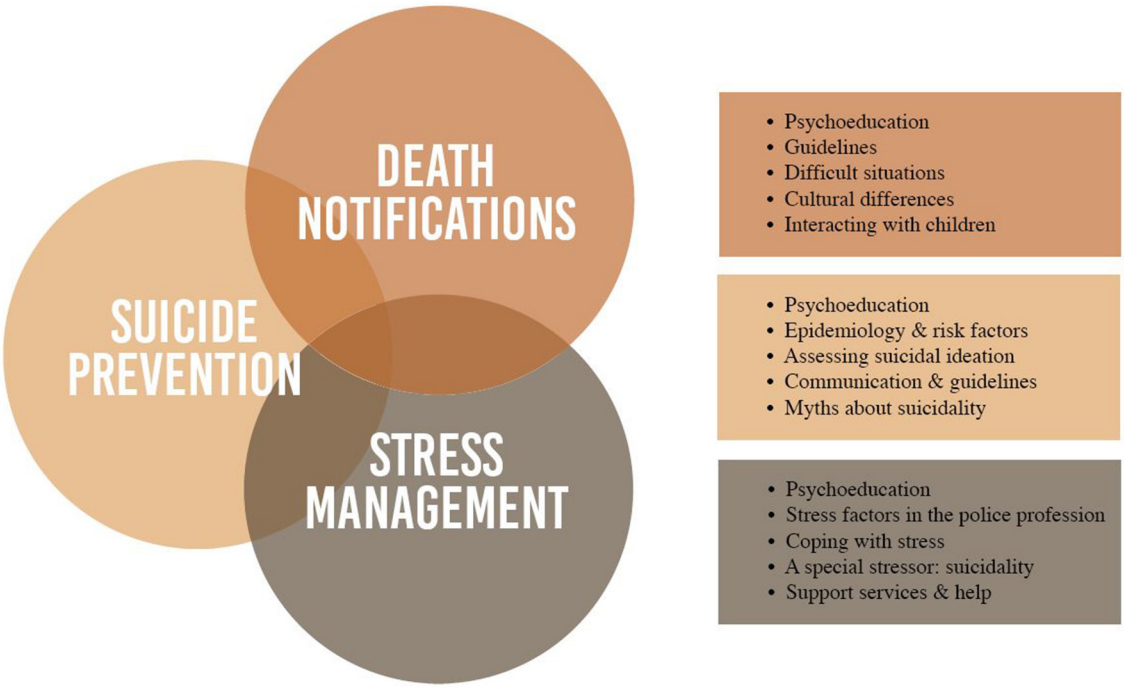

FIGURE 2 | Content of the modules.

of certain police operations ($N = 142$) (35). This information was used to develop the three modules of the training. Further, after the e-learning program was developed, a pilot study with students ($N = 8$) of a police academy was conducted and evaluated for its correctness and usefulness. The suggestions and corrections were then incorporated into the training.

Modules

The training has three modules: (1) delivering death notifications, (2) dealing with individuals with suicidal ideation and (3) coping with one's own stress and suicidal thoughts in the police profession (see **Figure 2** for an illustration of these components and their intersections). The fully detailed contents of each module are in the **Supplementary Material**.

Working on the tasks of each module takes about 20 min. However, the participants could complete the training independently at their own pace. Participation was free of charge and voluntary. Participants could cancel the training at any time without a reason. Furthermore, the project coordination could be contacted at any time with questions or problems.

The modules are based on the guidelines of the police in Germany for the delivery of death notifications and for dealing with suicidal behavior (36–38). Psychoeducational content is based on the principles of cognitive behavioral therapy.

All modules follow a similar structure: introduction to the topic, psychoeducation, practical guidelines for the police operation as well as advice for communication based on practical case studies. The third module (stress in the police profession) is more practical and also includes methods for recognizing one's own stress, preparing emergency plans in the event of suicidal thoughts, relaxation exercises and information on support services and their consequences for the police profession. Each module contains worksheets for further study of the topic as well as for personal discussion and self-reflection. In addition, there are quizzes with self-grading of the content learned. The training ends with an overview of relevant literature on the various topics.

The Training Tools

For the training the Wordpress plugin Learnpress© was used. This plugin was integrated into an existing Wordpress© site and offers the possibility to provide different content for online training. All necessary data protection regulations have been met. The access to the training was protected with a password to prevent access by unauthorized persons. Thus, only those participants can access the training who are allowed to attend the training based on the conditions.

The individual modules are presented as videos with additional audio recordings also with additional worksheets and handouts. To increase knowledge, quizzes are included in the program within each module. The worksheets and handouts could be downloaded by the participants. The training could be completed on the laptop and PC as well as on the smartphone or tablet.

Statistical Analysis

Data were analyzed using SPSS 25 (39). The demographic data were analyzed using descriptive statistics and frequencies,

whereas we presented means, standard deviations, and range for the continuous variables and frequencies for categorical variables. Hierarchical multiple regressions were run to identify factors that influence self-assessed competence at baseline. Paired *t*-tests were used to analyze the change in the respective outcomes from baseline to post. For analyzing any moderating effect of years in the police profession or work location, a moderator analysis was performed using the PROCESS macro for SPSS (40). The questionnaire on the usefulness of the training will be evaluated descriptively to examine how the training was finally evaluated. Cohen's d was used for calculating effect sizes (41). Due to the high amount of missing data at follow-up, these data could not be included in the analysis.

RESULTS

Response Rate

A total of $N = 296$ interested individuals registered for the training. Complete baseline data are available from $n = 194$ (65.5% response rate). One hundred and two individuals are considered dropouts, most of whom ($n = 93$) did not report back after registration, $n = 4$ could not be included because they were not police officers, and $n = 5$ lacked time or interest. Of the $n = 194$ participants who were finally enrolled in the study, $n = 52$ did not participate. The reason for this was no time, private problems or the participants did not respond. Complete post-training data are available from $n = 102$ participants (71.8% response rate). We registered a very high attrition rate at follow-up, with only $n = 18$ participants completing the questionnaire (17.6% response rate), therefore, the follow-up data are not included in the analyses. Completers of follow-up did not significantly differ from non-completers regarding sex, age, years in profession, or work place.

Demographics

More than half of the participants were male ($n = 63$, 61.8%) with an average age of $M = 38.75$ ($SD = 9.92$). 87.3% ($n = 89$) had already completed their police training at the time of participation. Participants had been employed by the police for an average of $M = 16.14$ ($SD = 10.95$) years, and most of the officers were employed by the Swiss police ($n = 42$, 41.2%), followed by participants from the Berlin police ($n = 38$, 37.3%). The remaining participants came from various German states. For further information regarding the participants' demographics, see **Table 1**. There are different ways to become a police officer in Germany and Switzerland. It is possible to complete a University degree, an apprenticeship or even retraining.

Hierarchical multiple regressions were run to determine if the stepwise addition of demographic factors (age, gender, years in the profession) as well as knowledge and attitudes toward suicide influenced participants' self-assessed competence at baseline. We first analyzed the influence on self-competence in general. The addition of the knowledge-score at baseline led to a statistically significant increase in R^2 of 0.12, $F_{(1,95)} = 13.57$, $p < 0.001$, indicating that a higher level of knowledge contributed to a higher evaluation of one's own competence. We were able to find the same results for the subscale *competence in delivering death notifications* [$R^2 = 0.09$, $F_{(1,95)} = 9.20$, $p = 0.003$]. When analyzing the subscale *competence in dealing with people with suicidal ideation*, the addition of knowledge again had a significant influence [$R^2 = 0.08$, $F_{(1,95)} = 9.09$, $p = 0.003$], but so did the number of years in the profession, with an increase in R^2 of 0.05, $F_{(1,97)} = 5.73$, $p = 0.019$, suggesting that the more professional experience a participant has, the more competent they feel in dealing with persons with suicidal tendencies. Last, both knowledge, again [$R^2 = 0.08$, $F_{(1,95)} = 8.92$, $p = 0.004$], and also attitudes toward suicide (ATTS) had an impact on how competent participants felt in managing their own stress levels with an increase in R^2 of 0.06, $F_{(1,97)} = 6.51$, $p = 0.012$, indicating that the more positive attitudes toward suicide and mental health problems are, the more competent participants rate themselves on the subscale *competence in one's own mental health.*

TABLE 1 | Characteristics of participants ($N = 102$).

	M (SD)	Range
Age in years	38.75 (9.92)	19–59
Duration of employment in years	16.14 (10.95)	0.5–43
	N	**%**
Gender (male)	63	61.8
Marital status		
Single	18	17.6
In a relationship	19	18.6
Married	50	49.0
Divorced	15	14.7
Education		
Secondary (9 or 10 years of school)	23	22.6
Further (13 years of school)	34	33.3
Higher (university degree)	34	33.3
Apprenticeship (3-year training)	11	10.8
Completed Training as Police Officer	89	87.3
Work location		
Switzerland	42	41.2
Berlin	38	37.3
Other states of Germany	22	21.5

Program Effectiveness

The results in **Table 2** show significant improvement in overall self-assessed competence and in the respective competence subscales. Participants rated themselves as more competent overall after training with 95% CI [−13.89; 8.44], $t_{(101)} = -8.13$, $p < 0.001$. Analyzing the effectiveness of the training concerning the individual subscales, the self-assessed competence regarding the delivery of death notifications (95% CI [−5.59; −3.46], $t_{(101)} = -8.72$, $p < 0.001$), suicide prevention (95% CI [−6.09; −3.26], $t_{(101)} = -6.56$, $p < 0.001$), and dealing with one's own mental health (95% CI [−2.90, −1.12], $t_{(101)} = -4.48$, $p < 0.001$) improved significantly at post-measurement.

Knowledge also improved significantly after completing the training, with 95% CI [−4.30, −4.90], $t_{(101)} = -9.41$, $p <$

TABLE 2 | Descriptives and *t*-tests for baseline and post training ($N = 102$).

	Pre-Training		Post-Training		$t_{(101)}$	95%CI	*p*	*d*
	M	*SD*	*M*	*SD*				
Competence total score	68.63	13.03	79.79	11.13	**−8.13**	**−13.89, −8.44**	**<0.001**	0.92
Death Notifications	18.25	5.20	22.74	4.43	**−8.72**	**−5.50, −3.46**	**<0.001**	0.93
Suicide Prevention	28.01	6.68	32.69	5.04	**−6.56**	**−6.09, −3.26**	**<0.001**	0.79
Mental Health	22.36	3.79	24.37	3.66	**−4.48**	**−2.90, −1.12**	**<0.001**	0.54
Knowledge total score	22.44	3.37	26.49	3.90	**−9.41**	**−4.30, −4.90**	**<0.001**	1.12
Death Notifications	9.97	1.56	10.97	1.50	**−5.26**	**−1.38, −0.62**	**<0.001**	0.65
Suicide Prevention	6.92	1.74	8.45	1.88	**−7.27**	**−1.95, −1.11**	**<0.001**	0.85
Mental Health	5.55	1.55	7.07	1.65	**−7.86**	**−1.90, −1.14**	**<0.001**	0.95
ATTS total score	2.99	0.26	2.97	0.27	0.83	−0.06, 0.06	0.409	0.08
Suicide as a right	2.23	0.61	2.22	0.64	0.22	−0.09, 0.11	0.827	0.02
Incomprehensibility	2.89	0.58	2.89	0.63	0.16	−0.09, 0.12	0.877	0.00
Non-communication	3.23	0.45	3.25	0.48	−0.44	−0.11, 0.07	0.664	0.04
Normal-common	2.89	0.68	2.86	0.68	0.38	0.16, 0.37	0.709	0.04
PHQ Depression	3.34	3.33	2.77	2.55	1.86	−0.04, 1.18	0.066	0.19
PHQ Anxiety	0.03	0.17	0.01	0.10	1.00	−0.02, 0.06	0.320	0.04
PHQ Functional Impairment	0.30	0.52	0.26	0.49	0.815	−0.06, 0.13	0.417	0.08

ATTS, attitudes toward suicide; PHQ, patient health questionnaire.
Significant results are in bold.

0.001. Looking at the individual subscales, knowledge improves significantly regarding delivering death notifications (95% CI [−1.38, −0.62], $t_{(101)} = -5.26$, $p < 0.001$), suicide prevention (95% [CI –1.95, −1.11], $t_{(101)} = -7.27$, $p < 0.001$), and mental health (95% [CI –1.90, −1.14], $t_{(101)} = -7.86$, $p < 0.001$).

We found almost no significant difference in attitudes toward suicide. In the subscales included, there is almost no change in the mean values after the training.

Furthermore, no improvement could be observed in the participants' symptoms of depression (95% CI [−0.04, 1.18], $t_{(101)} = 1.66$, $p = 0.066$), functional impairment (95% CI [−0.06, 0.13], $t_{(101)} = 8.15$, $p = 0.417$), and anxiety (95% CI [−0.02, 0.06], $t_{(101)} = 1.00$, $p = 0.320$) as a result of the training.

Moderating Effects

Moderation analyses were run to examine the moderating effect of years in the police profession on changes in self-rated competence and knowledge from baseline to post, since we could find significant changes after completing the training.

Testing for a moderating effect on competence in general, the overall model was significant [$R^2 = 0.13$, $F_{(3,98)} = 4.48$, $p = 0.005$], whereas we could not find a significant moderating effect of years in the police profession with $\Delta R^2 = 0.01$, $F_{(1,98)} = 0.66$, $p = 0.417$, 95% CI [−0.03, 0.01]. The overall model for the subscale *competence in delivering death notifications* was again significant [$R^2 = 0.22$, $F_{(3,98)} = 6.94$, $p < 0.001$], but also no significant moderating effect could be found with $\Delta R^2 = -0.03$, $F_{(1,98)} = 2.23$, $p = 0.139$, 95% CI [−0.03, 0.002]. The overall model for the subscale *competence in suicide prevention* was not significant ($R^2 = 0.08$, $F_{(3,98)} = 2.36$, $p = 0.077$), as was the moderating effect with $\Delta R^2 = 0.003$, $F_{(1,98)} = 0.19$, $p = 0.667$, 95% CI [−0.02, 0.01]. The same results could be found for the subscale *competence in one's own mental health* with $R^2 = 0.08$, $F_{(3,98)} = 1.79$, $p = 0.153$ for the overall model and $\Delta R^2 = 0.01$, $F_{(1,98)} = 0.42$, $p = 0.516$, 95% CI [−0.01, 0.03] for the moderating effect.

We found similar results for the knowledge level after training. Again, the overall model was significant [$R^2 = 0.09$, $F_{(3,98)} = 2.76$, $p = 0.046$], but also without any significant moderating effect of years in the profession ($\Delta R^2 = 0.00$, $F_{(1,98)} = 0.03$, $p = 0.859$, 95% CI [−0.02, 0.02]).

We also tested for a moderating effect of the work location (Germany and Switzerland), but no effect could be found for any outcome (see **Supplemental Material**).

Participants' Evaluation of the Program

The majority ($n = 90$, 88.3%) of the participants agreed or strongly agreed that the e-learning program was helpful, 88.7% ($n = 91$) would recommend the training to a colleague, 93.2% ($n = 95$) found the content and information well-prepared and presented, and 80.4% ($n = 82$) stated that they had learned important aspects for their work. Three quarters of the participants ($n = 79$, 77.4%) agreed that they feel more secure in delivering death notifications after the completion of the training, and that they could learn new aspects about delivering death notifications ($n = 86$, 84.3%). Regarding dealing with individuals with suicidal ideation, more than three quarters ($n = 80$, 78.4%) somewhat or strongly agreed that they feel more secure after the training, and 76.5% ($n = 78$) stated that they learned more about the topic. 75.5% ($n = 77$) agreed that they would try some suggestions and strategies for dealing with mental stress and that they found it helpful ($n = 81$, 79.4%).

Participants were also able to provide individual feedback, which described the training as a whole as helpful, clearly

structured and easily understandable, with a highly relevant selection of topics, and with helpful case studies and suggestions for communication. The additional materials in the form of handouts and worksheets were also mentioned positively. The criticism was mainly related to the fact that the missions in reality usually run differently and there is no fixed procedure to adhere to. Guidelines can therefore only be applied to a limited extent. Some participants found the videos too long, and other participants would have liked more quizzes to test knowledge. Additionally, some reported technical difficulties with some devices.

DISCUSSION

The aim of this study was to evaluate an online training program for police officers and to improve knowledge and self-rated competence in delivering death notifications, in suicide prevention, and in recognizing one's own stress and suicidality. The e-learning program desired to help police officers better recognize their own stress, offer helpful methods and enhance help-seeking behavior. Furthermore, the program should reduce negative and stigmatizing attitudes about individuals with suicidal ideation and behavior. Along the lines of empirical findings, these three domains represent relevant challenges strongly related to the police profession.

First, we found a significant increase in knowledge after completing the training as well as in self-rated competence. The results are in line with previous studies also finding a significant increase in police officers' knowledge and competence regarding suicidality and depression through gatekeeper training (10, 42).

Increasing knowledge is essential to the profession for many reasons. First, as we found in our sample, higher knowledge leads police officers to rate themselves as more competent. Lacking knowledge is one of the main problems in caring for vulnerable groups (43). With broad knowledge of suicide prevention, police officers may gain confidence in dealing with challenging situations. Even though not all aspects can be addressed by knowledge through training, and complete preparation for missions is not possible, higher self-competence might finally increase self-confidence and decrease stress in such situations. Lack of knowledge and wrong assumptions as well as insecurity due to this are the most common reasons for discrimination and stigmatization (14). Bereaved individuals not infrequently experience stigmatization by the police and therefore perceive contact much more negatively (12). By imparting knowledge, the understanding of persons increased and negative assumptions were reduced, which in turn facilitates better handling of affected persons and also allows police officers to deal with situations more confidently (44).

Further, the role of police officers as gatekeepers in suicide prevention is essential and often underestimated. A competent appearance and knowledge of suicidality can promote adequate interaction with those affected. By informing on suicidality, it can be recognized and assessed more effectively, facilitating identifying risk persons. In their study, Terpstra et al. (45) could show that increased knowledge about suicidality can increase the confidence to talk about it and to help identify individuals at risk.

In the long term, greater knowledge and competence in dealing with one's own stress levels can lead to an increased sensitivity and help better recognize and assess one's own stress. In the police profession, mental disorders are still highly stigmatized. In their study, Karaffa and Koch (21) found that public stigma and self-stigma correlated negatively with seeking help. A broad knowledge of the pathogenesis of stress and mental disorders, as well as education about myths, can help better support those affected and facilitate open communication, since stigma is a barrier to seeking help (44).

Further, we did not find any differences in the other subscales of the ATTS. In their review on gatekeeper training for suicide prevention, Burnette et al. (16) stated that evidence for changing attitudes is limited. One reason for this may be that attitudes do not change within a short period of time. Attitudes may be formed over a longer period of time and be shaped by experiences. Another reason might be that the police-officers' attitudes were already neutral to positive at baseline. Therefore, little positive change is to be expected.

We did not find any significant effect of the training on symptoms of depression and anxiety. There might be a number of reasons for this finding. First, symptoms of depression usually do not improve after such an ultra-short intervention but require a period of time and changes. Second, even though participants were taught coping strategies in module 3, the psycho-educational information about depression was only a small part of the module, with a stronger focus on stress-management.

Finally, it seemed important to analyze a potential moderating effect of years in the police profession. We expected that the longer participants worked as police officers, the more competent they would consider themselves and the more knowledge they would have, meaning these participants would benefit less from the program (10). However, we did not find any moderating effect of years of duty. We also did not find any moderating effect of the country participants work in.

Limitations

Trainees in this COPS e-learning program could benefit in several ways, as numerous positive outcomes reveal. However, there are limitations of the study. One is that we experienced a high attrition rate at follow up. It already became very difficult to motivate participating police officers to complete the post measure, and the same problem arose during the follow-up. Participants were kindly reminded several times by mail to fill in the questionnaire, but almost none responded. Thus, it is unfortunately not possible to investigate long-term effects of the training. After completing the post questionnaire, participants received an official certificate and were able to take part in a raffle of vouchers. Participants received nothing for the completion of the follow-up questionnaire, which could have significantly reduced their motivation. Interestingly, Arensman et al. (10) as well as Marzano et al. (42) had the same problem with the response rate at follow-up in their trainings for the police. Future studies could address this problem by offering an incentive for

completing the follow-up questionnaire. Additional further study information and the importance of the data at the beginning of the program would be useful to improve the overall response rate.

We also had to exclude some subscales due to low internal reliability of the ATTS, which were significant in the pre-post-comparison. The ATTS is used in many international studies (46, 47), but it is also criticized in part because of the generality of the dimensions and the partly low reliabilities (48, 49). In addition, some factors consist of only two or three items, so that internal consistency cannot be improved by excluding the respective items. Consequently, several studies advocate a new factor structure of the ATTS (49).

Furthermore, some of the questionnaires were specially developed for this study and have therefore not yet been validated. Another limitation is the lack of a control group against which we can compare the effects. Further studies should therefore compare one group that undergoes the training as reported here and another group that receives either no training (e.g., as a waitlist control group) or an alternative e-learning program.

CONCLUSIONS

In recent years e-learning programs have proven to be a low threshold alternative to face-to-face training to provide training for different groups, specifically in suicide prevention (32, 50, 51). The increasing digitalization makes online training more and more relevant, becoming an integral part of everyday work life, since it is time-saving and inexpensive. The training could increase knowledge as well as competence in police officers and give police officers the opportunity to educate themselves anonymously and in a low-threshold way.

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 Ethics Committee of the Medical School Berlin, Germany Registration number: MSB-2020/27. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LH and BW planned the study, developed the manual and training with the assistance of HG and MP, and wrote the manuscript with the help of HG and MP. LH coordinated the study procedure, programmed the e-learning program, prepared the materials, and performed the analyses. BW supervised the project. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

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Perceptions of Therapeutic Intervention in Suicide Crisis Counseling in Experienced Korean Counselors: A Concept Mapping Study

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Within Organization for Economic Cooperation and Development (OECD) nations, South Korea has the highest suicide rate for which immediate prevention measures are sought including effective therapeutic counseling interventions. As such, the present study explored and examined experienced South Korean counselors' perception of therapeutic interventions for the prevention or delaying of completed suicide, using concept mapping methodology. The semi-structured interviews were provided to 15 study participants of experienced counselors having a minimum of 5 years of professional counseling career and at least 10 suicide crisis counseling sessions. A total of 77 statements were extracted with 8 major clusters: "Securing Safety," "Active Advocacy for Client," "Coping Skills Training," "Conceptualization of Suicide Crisis," "Emotional Identification and Validation," "Empowerment," "Counselor Self-Disclosure," "Counselor Self-Awareness and Regulation." From the results, the present study described unique findings in Korean counselors' perceptions of suicide crisis therapeutic intervention. Study limitations and future implications are further discussed.

Keywords: suicide crisis counseling, experienced Korean counselors, therapeutic intervention, concept mapping, counselor perception

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INTRODUCTION

From 2003 to 2019, South Korea continuously had the highest suicide rate among Organization for Economic Cooperation and Development (OECD) nations except for 2017 (1). That is, the average suicide rate in Korea indicates 24.6 persons in every 100,000 citizens, exceeding the global average of 11.5 persons for the same population (2). Investigating the nation's sociocultural background and suicide risk factors that are contributing to such a high rate is necessary, and research on distinguishing effective therapeutic counseling interventions for suicide prevention is essential.

Suicide is an unfortunate event varying by individuals, and it is worth speculating on sociocultural background and possibly related risk factors that may influence the exceptional suicide phenomenon in Korea. Considering the sociocultural background, Korea has fast advanced in individualism and capitalism together; however, rooted in Confucianism, interpersonal relationship-based communitarianism in its society is quite influential and important in its culture.

In cultures that value individualism, individuals' wants and needs, rights, and diverse points of view are mutually respected, whereas communitarianism-based cultures accentuate common profits and interpersonal harmony (3). Especially according to the values of Confucianism affecting the Korean culture, conducting own duties in the family (4) and being a contributing citizen in the society are highly emphasized and suppressed (5). A communitarianism-based society can offer physical and psychological benefits to at-risk citizens when regulation and integration function well within the society; however, it can also negatively affect them when regulation and integration do not coherently function while undermining each citizen's individual values and overstressing the community benefits (6). Unfortunately, South Korea still experiences a certain level of instability and confusion between cultural communitarianism, Confucianism thoughts, and competitive individual values of western cultures due to its abrupt socioeconomic changes in the past decades (5), portraying an "anomic" state as decribed by Durkheim in 1987 (7). An anomic state is a pathological state with a weakened relationship between an individual and society. Between 1997 and 1998, the suicide rate in Korea suddenly increased due to the economic crisis (8, 9), and the rate has been continuously on the rise; the interpretation was that those individuals chose to commit suicide for feeling isolated and as a "burden" to others in weakened social integration (10).

In partial explanation for choosing suicide for the feelings of isolation and "burden" to others, Interpersonal Theory of Suicide (IPTS) has gained attention (11), and empirical research has been introduced with Korean participants (12–16). According to IPTS, suicide occurs when one's interpersonal desires and the capability for suicide coexist. Interpersonal desires consist of two aspects of "thwarted belongingness" and "perceived burdensomeness." Thwarted belongingness indicates a frustrated state of wanting to belong, loneliness and deficiency of reciprocal relationship; perceived burdensomeness indicates one's self-hatred with a sense of being a burden to others. IPTS underscores that thwarted belongingness with perceived burdensomeness along with having capability for suicide (e.g., high tolerance toward physical pain, fearlessness in death) together result in committing suicide. A survey study conducted on 402 college students (178 men and 224 women) indicated significant effects of self-worthlessness and a sense of burdensomeness to others on college students' suicide rates (12). Similar results were found in another study on 331 young adults of 19–35 years old (16).

When western (USA, Great Britain, Canada) and Asian (Hong Kong, Taiwan, China, Thailand) groups were compared, the common risk factors for both population groups were physical illness, mood disorder, substance abuse, and alcohol abuse (17–22). Studies on Korean clients having suicide attempts or cases of committed suicide are rare to find. The Korean suicide group of 122 and the comparison group of 40 cases were compared for suicide group characteristics (23). A psychological autopsy study with case-control design uses an odds ratio to examine the differences found in control and case groups, and its results indicated that the Korean suicide group had a significantly lower unemployment rate compared to the same population group in western studies. In contrast, disconnection/withdrawal from social activities and abrupt interpersonal atrophy were major indicators in this suicide group. In addition, self-injury and previous suicide attempts were reported as the most dangerous factors that are absent in the comparison group. Koreans were reported as being more influenced by their family and loved ones' suicide than those in North America and Europe (23). Experiencing a serious level of stress due to having problems with a domestic partner and failure in business also had an effect on suicide. A study on 537 patients with suicide attempts at the hospital emergency rooms revealed that the young women population had a significantly high rate for repeated attempts (24). Within the repeated suicide attempts group, the single-households (e.g., divorced, separated, and deceased partner) had a higher rate of suicide and a higher ratio of interpersonal problems (23). Those who have attempted suicide are found to have fewer problem-solving skills and alternative strategies compared to the comparison group (25).

Different cultures have different factors and approaches to effective counseling (26, 27). Some of the characteristics of Korean counselors were compared to those of the USA, Norway, and Germany in a study, and the results demonstrated that only 5% in the western countries practiced counseling without a particular theoretical framework while 34.5% of Korean counselors practiced counseling without a theoretical framework (28). The interpretation of this result includes that limited applicability of the western theoretical framework can be carried on to Korean clients for the cultural, societal differences, and the study advocated that culturally fit counseling therapies should continue to develop (28). According to such needs, effective counseling factors in Korea were previously researched and the factors were "considering the client as own family member," "applying private/emotionally attached relationship," and "high involvement and active responses" as being effective factors reported by the Korean counselors (26). Advice or instructional interventions were found with a larger effect than in the western countries, and the clients' expectations included instructional, authoritative, short-term, and problem-oriented approaches (26, 28, 29). Korean clients tended to recognize counselors as competent when the counselors helped them express their inner feelings, in contrast to the expectation for the encouragement of rational objectivity (30, 31). Effective counseling factors in Korean counselors further included being aware of, understanding inexpressiveness on inner problems, patiently waiting in the initial stage, and realization of contrasting manifestations of the client's inner and outer expressions (26, 32). Additionally, Korean clients tended to consider effective counselors as exemplary role models and nurturers who can hold and withstand their negative feelings (29, 32, 33).

Knowing the helpful interventions in a counseling process for at-risk clients is valuable for suicide prevention education. The counseling process refers to both behavioral and verbal interactions between the client and counselor and their internal experiences from such interactions (34, 35). In contrast to the empirical and expert-derived studies on suicide crisis counseling competency in the western countries (36–38) and the studies on the client's recognition of effective counseling intervention in suicide crisis counseling (39, 40), Korea has

almost no previous research on counseling intervention and its contents. This reflects the country's relatively short history in counseling and the clients' tendency toward feeling reluctant and embarrassed about publicly talking about their counseling experience (41); this cultural tendency particularly makes suicide crisis counseling research especially difficult to conduct. In this respect, speculating viewpoints of the counselors with suicide crisis counseling experience can offer promising possibilities as a path to acquiring effective therapeutic interventions.

Especially, experienced counselors can provide meaningful insights through their developmental phases with a qualitatively structured complexity. Using a small number of concepts, they can build and coherently conceptualize cases (42), are able to quickly discern similar patterns from interrelations between complex concepts (43), and are able to effectively process inconsistent and contrasting information from their own procedural memory (44). As a result, they are capable of building effective strategies by transferring the client's unstructured problems into structured concepts for problem-solving. This is an essential clinical competency in suicide crisis counseling in which many ambiguous situations rise for sudden, firm actions and successful strategies as for the most appropriate solutions (45).

For such reasons, this study has two purposes. First, the study aimed to identify therapeutic interventions in suicide crisis counseling perceived by experienced Korean counselors. Emphasis on the consideration of the sociocultural context in counseling has been accentuated on many occasions by previous research (46, 47), and suicide-related risk factors, protective factors, and adequate therapeutic interventions vary by culture (48). Speculating experienced counselors coping strategies and counseling techniques with suicide crises in the Korean context is worthwhile for possible prevention in the future. Second, this study aimed to develop a cognitive map of the counselors' perceived interventions through visual representation. Understanding the representation of the clustered interventions derived from the concept mapping is expected to contribute to (1) educating similarly sorted interventions considered therapeutic and (2) prioritizing important interventions.

METHODS

The present study utilized the concept mapping methodology (49) to identify therapeutic interventions perceived by the counselors in suicide crisis counseling and to explore the structure of the interventions. Concept mapping consists of six procedural steps and is depicted in **Figure 1**.

Participants

Selection Criteria for Cases of the Suicide Crisis

Wenzel, Brown, and Beck defined suicide crisis as "a discrete, intense episode of suicide ideation accompanied by suicidal desire, a suicide attempt, or other suicide-relevant behavior" (50). However, terms related to suicide are not too refined, resulting in the mixed usage of "self-injury without suicidal attempts," "suicidal attempts with intention," and "completed suicide" for the general term "suicide" even among many professionals (50). In Korea, mutually agreed measurement (i.e., clinical scale) in suicide crisis counseling settings is absent. Therefore, this study defined the term "suicidal crisis" as "clients with suicide attempts with suicide intention" as the client's intention has been inspected as the crucial variable in suicide attempts (51). Also, suicide attempts in one's history have been the most predictive variable for later completed suicide, and it has been a strong indicator of increasing the risk of actual suicide with more fatal methods at a later stage (23, 24, 52–55).

Selection Criteria for Experienced Counselors

The criteria for experienced counselors in suicide crisis counseling had to be established. Since South Korea has a relatively short counseling history, several psychiatric doctors started psychological therapy in 1957 upon returning from the Korean War (56), and its history has only 20 years of counseling profession by general counselors, clinical counselors, social workers, and medical doctors under the provisions of Mental Health Care Act in 2000. Because of dissimilarities along with some existing similarities, the western nations and Korea may not place the same criteria to be applied; the present study attempted to derive the definition of experienced counselors from research findings done by Korean literature in the suicide crisis counseling field. First, in order to meet the operational definition, the participant's whole counseling career had to be 10 semesters (5 years) or more as in the studies by Kim and Moon (57) and Son and Kim (58). Second, a basis for a suicide crisis counseling career had to be established for a certain duration of suicide crisis counseling to be an "experienced" counselor; however, no bases or criteria can be found according to previous research in Korea. Hence, as an alternative, this study focused on success factors found in phone-based suicide crisis counseling studies (59–61) and learned that continuing with suicide crisis counseling is critical because continuation itself signifies the prevention and delay of completed suicide. In a typical clinical setting, 10 sessions of counseling are a common unit of the session number, and this is also the minimum number of sessions for reliable efficacy in 50% of the clients (62). For this reason, this study defined "experienced counselor" with at least 10 completed sessions of suicide crisis counseling as the minimum requirement. In summary, the selection criteria for experienced Korean counselors of suicidal crisis counseling included counselors (1) with a minimum of 5 years of counseling career, (2) having the clients with "suicide attempts with a suicide intention," and (3) having a minimum of 10 completed sessions.

Recruitment Process

Generating of statement process was done through both voluntary and referred participants. First, for the recruitment of voluntary participants, the study's purpose and information were posted on Korean Counseling Association (KCA) and Korean Counseling Psychological Association (KCPA). With approval by Institutional Review Board (IRB), the posting started on June 24, 2019, and recruitment ended on September 30, 2019. The purpose of the study, agreement for confidentiality, and possible risks that may arise during upcoming interviews

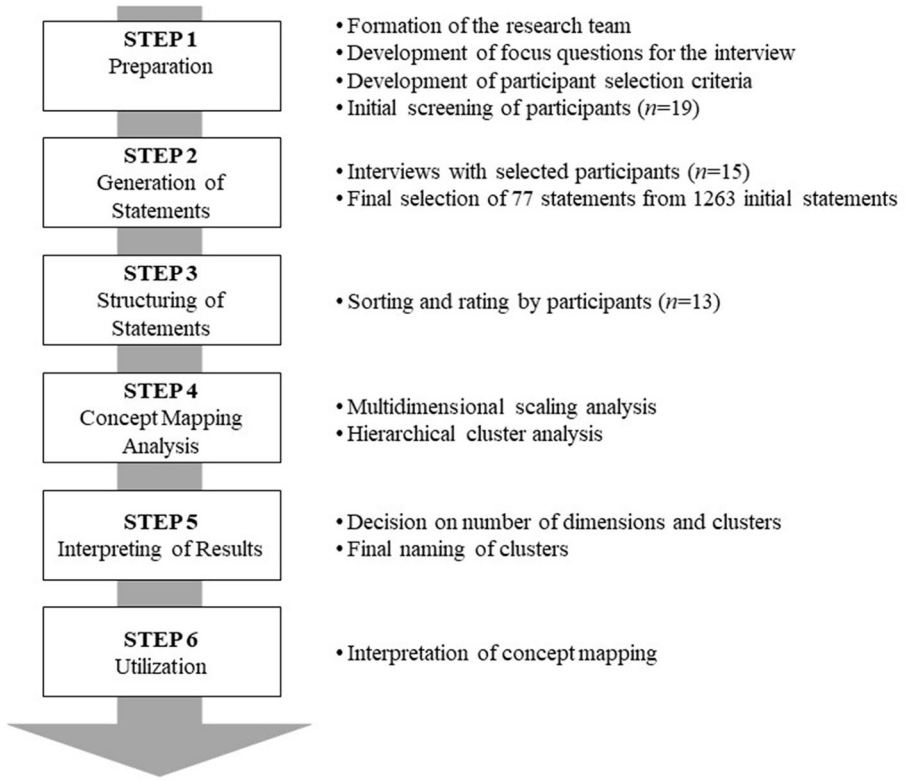

FIGURE 1 | Concept mapping process-results.

were shared with the participants. The next step included contacting related personnel at counseling agencies, counseling-related university professors, phone calls with some previous interview participants, emails, and direct visits through which the clear purpose of this study was explained and any referrals for participants were requested. After receiving referrals, voluntary participation was guaranteed by first disseminating the recruitment letter and then receiving the participants' written agreement to participate. This purposive sampling process is useful when recruiting professionals on relevant topics or when finding participants is difficult (49).

In the initial stage of recruitment, 19 counselors volunteered, of whom four were excluded because their number of counseling sessions did not meet the minimum requirement of 10 sessions (see **Figure 2**). Finally, 15 (three men and 12 women) counselors participated in this study, ranging from 34 to 50 years old ($M = 40.13$, $SD = 5.80$). Three of them had a master's degree, nine were currently in the Ph.D. program, and three of them already graduated from a doctoral program. One participant was employed at a corporation, four participants were practicing at clinics, five were working at the universities, one was working for the national public sector, and four were working at private counseling centers. Ten of the 15 participants owned a supervisory license and the remaining five participants owned a professional counselor license by the Korean Counseling Association (KCA) or Korean Counseling Psychology Association (KCPA), and their average counseling career was 9.8 years. Thirteen of them also participated in sorting of statements and importance rating (Step 3) in the later process of the study.

Procedure

Step 1: Preparation

In step 1, the research team developed the focus questions for the interview. The focus questions were, "For the suicide crisis counseling clients, what do you believe are some therapeutic interventions?" After IRB approval was attained, participants were finally recruited. Kane and Trochim suggested a minimum of 10 study participants and emphasized statement generation should be sufficiently collected (49).

Step 2: Generation of Statements

The primary researcher conducted the interview with 15 participants. The interviews lasted between 50 and 90 min with an average time of 70 min. Interview materials were transcribed exactly following the participants' verbal expressions. In line with guidelines by Kane and Trochim (49), two doctoral students with extended suicide crisis counseling experience with an average of 11 years in career made a research team with the primary researcher and extracted therapeutic intervention lists. Any disagreements were resolved after a thorough discussion by comparing extracted intervention variable lists. A total

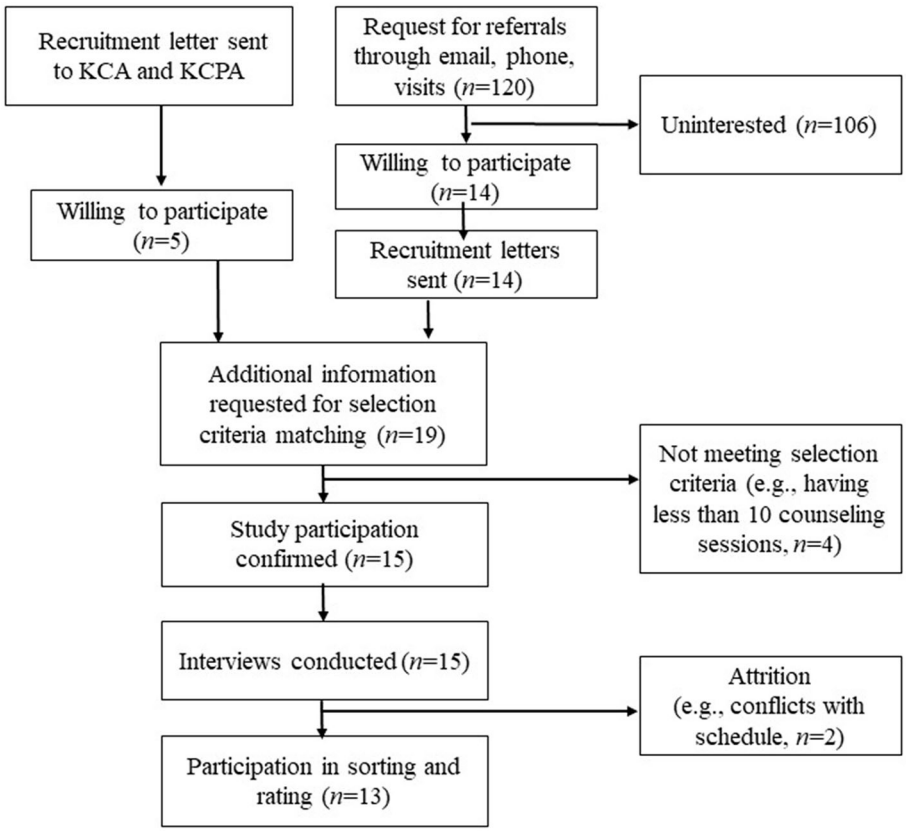

FIGURE 2 | Participant process flow chart.

of 1,263 statements were extracted from the interviews. The average number of statements was 84.2, reflecting 55–137 per participant. For the review of the adequacy of interview materials to true statements, transcriptions and statement items were sent to 15 participants by email or in person for verification and confirmation.

Kane and Trochim accentuate that for concept mapping to be successfully conducted, the number of statements and accuracy of the statements were the most important factors (49). Therefore, while maintaining brainstormed ideas, reducing the number of statements is necessary for idea synthesis processing. Although no concrete agreements were made on the most appropriate number of statements, Kane and Trochim recommend not to exceed 100 statements (49). In the first phase, the grouping was based on the conceptual area of intervention similarity. In the second phase, three research team members gathered to judge if the statements were just for therapeutic interventions, whether to keep the same grouping or to sort into a different grouping. With the guidelines by previous research (63), the synthesis process included only those statements found in common by at least two participants. In the third phase, only representative statements in sorted groups were generated. As a result, 85 representative statements were extracted. Then, for the evaluation of clarity and comprehensiveness, interview participants together discussed and exchanged the clarity and comprehension level of the statements. The research team edited once more after receiving feedback from those participants. A total of 77 statements were finally chosen.

Step 3: Structuring of Statements

On those 77 statements as therapeutic interventions, 10 x 3 cm cards were made and distributed to 13 participants for the grouping of homogeneous piles based on their conceptual similarities. In doing so, they were specifically advised not to make one card as a group or all of the cards together as a group and further advised to write an appropriate title for each pile of cards. After the sorting, the participants were asked to rate 1–7 on the scale of importance (1 = not at all important, 7 = extremely important) for each statement as the therapeutic intervention. Due to personal reasons, only 13 participants participated in the sorting and rating process.

Step 4: Concept Mapping Analysis

The following three steps of data analysis were implemented for concept mapping. In the first step, a similarity matrix was developed based on the results of 13 participants conducting the sorting. When the statements were grouped the same, the statement was coded as 0; when the statements were grouped differently, the statement was coded as 1. As per the number of participants in the study, 77 x 77 similarity matrix was formed

with a combination of 13 piles to produce Group Similarity Matrix (GSM). In the second step, based on the group similarity matrix, the data was converted into a dissimilarity matrix using SPSS version 24, followed by multidimensional scaling analysis (ALSCAL). Using the results, the number of dimensions and meanings were analyzed for the therapeutic interventions in suicide crisis counseling. In the third step, the coordinate values derived from multidimensional scaling analysis were used for hierarchical cluster analysis (using Ward's method).

Step 5: Interpreting of Results

In step 5, the research team decided on the most meaningful number of clusters, and the participants' naming of the clusters was reflected and are explained more in detail later in the results section.

Step 6: Utilization

In step 6, the statements and clusters were presented in a two-dimensional graph, and the important topics of therapeutic interventions were deduced. More explanations are to follow later in the results section.

Testimonial Validity

The concept mapping method has the strength of minimizing subjective viewpoints of the researchers (64) while reflecting participants' awareness of the occurrence through the research procedure (65, 66). Testimonial validity was designed to reflect participants' intentions during the process. First, the participants were contacted by email for reconfirmation of their responses on therapeutic interventions upon extraction. Second, a final list of 77 statements, along with the evaluation's collection of basic statements, was forwarded to the entire participants, and their feedback on the statements was collected. Lastly, during the process of naming the clusters from the sorting, the participants' word choices and suggestions on sorting criteria and topics were reflected.

RESULTS

Multidimensional Scaling (Step 5)

In the multidimensional scaling analysis (ALSCAL), stress value is produced and used for the decision of dimension numbers. Kane and Trochim (49) state that "Stress measures the degree to which the distances on the map are discrepant from the values in the input similarity matrix" (p. 97). Kane and Trochim (49) assert 0.205–0.365 as the adequate range of the stress value. The sorting results were made into a similarity matrix and the multidimensional scaling analysis was conducted. From the results of the analysis, the associated stress value for the two dimensions was 0.31 ($R^2 = 0.49$); the three dimensions was 0.21 ($R^2 = 0.64$); the four dimensions was 0.15 ($R^2 = 0.75$); the five dimension 0.13 ($R^2 = 0.79$). Many researchers suggest that a two-dimensional model is ideal because a three-dimensional model can cause perceptual distortion although it can be visually presented (67). This study also chose a two-dimensional model as the most adequate model for the reason that a three-dimensional model was difficult to visually present after examining both two- and three-dimensional models within the valid stress value.

Hierarchical Cluster Analysis (Step 5)

The hierarchical cluster analysis was conducted using two-dimensional model coordinate values from 77 statement dissimilarity matrix. The guidelines by Gol and Cook (68) were followed to determine the number of clusters. First, 13 participants sorted 4–18 groups for the 77 statements on the similarity rating ($M = 12.0$, $SD = 4.38$). Second, each cluster's conceptual clarity, similarity within a cluster, and inter-cluster distinctions were considered. Using Ward's method dendrogram, 2–8 clusters were compared for the final decision of eight clusters. Subsequently, after carefully considering the overall structure of distinctive features of different clusters and the final statement contents in all cluster areas, each cluster was named. The participants' feedback on the naming of the clusters was reflected in this step. Cluster 1 is named "Securing Safety," Cluster 2 as "Active Advocacy for Client," Cluster 3 as "Coping Skills Training," Cluster 4 as "Conceptualization of Suicide Crisis," Cluster 5 as "Emotional Identification and Validation," Cluster 6 as "Empowerment," Cluster 7 as "Counselor Self-Disclosure," Cluster 8 as "Counselor Self-Awareness and Regulation." The statements for each cluster are presented in **Table 1**.

Interpretation of Concept Mapping (Step 6)

Effective therapeutic interventions in suicide crisis counseling perceived by the participants are presented (see **Figure 3**). The distance between clusters indicates conceptual similarity (63). That is, the closer the distance, the more similarly do the participants recognize the clusters. For instance, Cluster 1 (Securing Safety), Cluster 2 (Active Advocacy for Client), and Cluster 3 (Coping Skills Training) are recognized with a high level of similarity by participants. Situated on the right, these three clusters are composed of contents of counselors' active and instructional interventions to the clients. In particular, counselors recommend hospitalization or medication for the client's safety and further collaborate with their legal guardians. The counselors additionally educate on alternative behaviors and techniques to reduce self-destructive behaviors along with actively seeking assistance from related institutions and connecting the clients to social resources available, advocating for the clients. Situated on the top, Cluster 4 (Conceptualization of Suicide Crisis) consists of identifying the risk and protective factors necessary for understanding the client's suicide crisis and helping the client realize self-intention for suicide attempts. Situated on the left, Cluster 5 (Emotional Identification and Validation) displays interventions of the counselor's endurance and willingness to patiently wait for the client's painful feelings to be expressed while empathizing with such feelings. Situated on the lower left, Cluster 6 (Empowerment), Cluster 7 (Counselor Self-Disclosure), and Cluster 8 (Counselor Self-Awareness and Regulation) consist of interventions deeply involved in the internal variables of the clients; the counselors related to the clients through truthful and therapeutic relationships to help them attain hope and more positive reconstruction in life. The counselors self-disclose on many aspects and express that the clients' existence is meaningful

TABLE 1 | Statement by cluster on therapeutic interventions.

Cluster/statement	*M*	*SD*
Cluster 1: Securing Safety	5.59	0.70
01. Flexibly modify counseling frequency and time for crisis management.	4.62	1.33
03. When urgent, prioritize crisis management rather than rapport building.	5.85	1.21
11. When the client's functional level is low, focus on his/her safety and delaying the crisis.	5.62	1.26
19. Buy time by initially delaying suicide.	5.85	1.14
24. Work on improvement of problems with the client's present functional level so as to lower the crisis.	6.00	1.00
28. Provide emergency contact number in case of emergency.	6.46	0.78
29. Firmly state about counselor's stance opposing suicide.	4.46	1.51
31. Inform the client's (legal) guardians of the crisis and educate adequate coping skills for the crisis.	6.23	0.83
35. Inform what cannot be done during counseling, and discuss self-coping strategies.	5.15	1.57
36. If need be, recommend appropriate medication and steadily monitor the medication progress	5.77	0.83
37. Yield the client's promises on not committing suicide attempts.	5.15	1.41
44. If danger is detected, recommend hospitalization and support with the process.	5.69	1.32
51. Inform on suicide-related confidentiality and its limitations, and discuss necessary steps.	6.23	0.83
59. If urgent, check the client's safety first and help the client stabilize.	6.38	0.77
60. Consider potential influences to the client when hospitalization stops counseling sessions.	4.62	1.26
65. Build safety plans with the client, and, when necessary, counselor takes the lead in the process.	5.38	0.96
Cluster 2: **Active Advocacy for Client**	5.27	0.85
09. In order to unnecessary confusion, use the clear and easy-to-understand language.	4.77	1.59
12. Even after counseling sessions have been terminated, periodically check for safety.	4.23	1.59
17. When exploring suicide attempts/impulsive episodes, neutrally react upon facts rather than emotionally responding.	5.38	0.77
39. Find out social network support and help establish such support system.	5.38	1.04
47. Ask for help through counselor's affiliation (e.g., session extension, adjusting on sliding scale, substitute counselor when absent, etc.).	5.77	0.83
53. Be self-aware of counselor's intuition regarding the client's suicide risks.	4.92	1.38
55. Inform on resources that the client can use when in need of help.	5.38	1.26
63. Discuss about counseling termination timing and process for the client's various emotions related to reliance on the counselor.	5.69	0.95
77. Continuously monitor for suicide ideation and impulsivity.	5.92	0.86
Cluster 3: Coping Skills Training	5.27	0.91
05. Assist with acquiring effective coping skills for handling relationship conflicts affecting client's suicide crisis.	5.15	1.14
45. Inform alternative options to be replaced for suicide.	4.85	1.57
48. Help reduce self-destructive behaviors (e.g., alcohol abuse, dangerous sexual activities).	5.31	1.32
52. Help maintain simple ways of living (e.g., eating well, washing, sleeping, walking).	5.38	1.12
68. Help maintain regularity in life academically and/or in career.	5.38	1.50
72. Inform clear consequences of problem behaviors.	5.00	1.00
73. Explore self-injury process and discuss with the client about the ways of reducing it.	5.08	1.04
76. Inform specific behavioral steps for coping well.	6.00	0.82
Cluster 4: Conceptualization of Suicide Crisis	5.63	0.73
02. Evaluate protective factors of client's suicide risks.	5.77	1.24
07. Explore what suicide triggers mean to the client's life.	5.62	1.19
08. Check core beliefs of suicide attempts/impulsivity.	5.92	0.95
10. Understand client's weak functions and resourceful positive aspects.	5.08	1.44
15. Explore client's childhood background that may have effects in suicide ideation/impulsivity/ attempts.	5.08	1.19
32. Understand client's suicide crisis as the comprehensive manifestations of emotional, cognitive, physical and behavioral dimensions.	6.23	1.09
67. Explore carefully on the process from the triggers of suicide to attempts/impulsivity	5.54	1.05
69. Find out personal history, diagnosis and environmental factors that increase suicide risks.	5.46	1.13
75. Help client become aware of the reason and intention of suicide attempts.	6.00	1.00
Cluster 5: Emotional Identification and Validation	5.54	0.58
16. Name and identify the client's feelings behind suicide ideation/impulsivity/attempts and stabilize such feelings.	5.77	1.09

(Continued)

TABLE 1 | Continued

Cluster/statement	*M*	*SD*
18. Observe the client's emotional state	5.38	0.96
26. Explore the client's feelings regarding suicide impulsivity/attempts.	5.69	1.38
33. Understand and sensitively respond to the prominent emotions (e.g., having a devastated feeling of left alone) that brought to the suicide crisis.	5.85	1.14
50. Listen attentively and stay on the contents and emotions throughout repeated suicide impulsivity and attempts.	5.62	0.96
25. Assist in expressing negative feelings concretely.	5.77	1.24
41. Lead the client not to avoid fearful feelings, but to have him/her be aware of, admit and stay with such feelings.	5.38	0.96
57. Use various methods (e.g., imagery, drawing) to help the client express his/her inner being.	4.54	0.78
66. Help and understand the client's ambivalent feelings toward death.	5.38	0.77
71. Assist the client to be aware of own desires or hopes related to own fearful emotions.	5.92	1.04
38. Be present with the client for his/her pain and dealing with his/her devastation.	6.31	0.63
42. Recognize the client's psychological and physical pains throughout suicide attempt.	5.08	1.19
58. Understand and empathize the fact that the client's desire to die does not go away easily.	5.23	1.01
61. Understand and support difficult feelings underlying the client's unwillingness to cooperate.	5.31	1.11
74. Empathize and validate the client's pains bad enough to want to commit suicide.	5.85	0.90
Cluster 6: Empowerment	5.15	0.92
13. Help the client constructively make his/her own meanings of life.	4.77	1.59
23. Try to find the client's wants and help become hopeful about them.	5.08	1.04
49. Recognize client's strengths and resilience for being alive at the moment.	5.69	1.11
56. Recognize and encourage client's small changes.	5.46	1.45
64. Reframe the existing problems from the positive perspective.	4.62	1.04
06. Obtain client's cooperation on intervention after establishing a reliable rapport.	5.15	1.28
14. Be a good object and reparent according to his/her developmental stage.	5.15	1.41
27. Help the client eventually face his/her own problems objectively without being controlled by the client and wait appropriately.	5.46	1.45
30. Treat the client with value and accept with unconditional positive regard	5.46	1.56
40. Sensitively seek intervention points with patience for good changes in the depressed and helpless client.	5.38	1.19
43. Support first even when the client crosses the boundaries with the counselor.	4.46	1.27
Cluster 7: Counselor Self-disclosure	4.91	1.08
20. Self-disclose counselor's humane feelings from listening to client's suicide impulsivity/attempts	4.77	1.09
21. Express that the client is meaning and important person to the counselor.	5.31	1.25
22. Tell the client that his/her death has an influence on the counselor.	4.38	1.45
34. Express "warm welcome" upon the client's return.	4.92	1.32
54. Deliver to the client the message the counselor wishes him/her to stay alive.	5.15	1.63
Cluster 8: Counselor Self-awareness and Regulation	5.77	0.86
04. Expand counselor's viewpoint on useful interventions through handling counselor's own difficulties through consultation/supervision/individual counseling	6.00	1.41
46. Endure overwhelming and negative feelings counselor experiences during suicide crisis counseling.	5.92	1.38
62. Recognize counselor's own negative feelings toward the client (e.g., anxiety, anger, frustration, helplessness, etc.)	5.77	0.83
70. Be careful not to intervene for the purpose of getting rid of counselor's own anxiety.	5.38	1.50

and important while realizing their own fear, suppression, overwhelmingness, and readjust accordingly to meet the client's therapeutic needs and provide adequate intervention.

As **Table 1** illustrates, the average rating of importance for all 77 statements was 4.23, above the medium importance of four points. The statement indicating most importance for therapeutic intervention in suicide crisis counseling was "28: Provide emergency contact number in case of emergency" followed by "59: If urgent, check the client's safety first and help the client stabilize," marking 6.46/7.00 and 6.38/7.00, respectively. Other items scoring higher than 6.0 of importance were Statements 28, 59, 38, 31, 32, 51, 4, 76, 24, and 75, and those can be interpreted as the prioritized therapeutic interventions. The importance rating results on those 8 clusters confirmed by the Ward's method are presented in **Table 2**. The importance rating by cluster showed that Cluster 8 (Counselor Self-Awareness and Regulation) had the highest mean $M = 5.77$, followed by Cluster 4 (Conceptualization of Suicide Crisis) with $M = 5.63$ and Cluster 1 (Securing Safety) with $M = 5.59$.

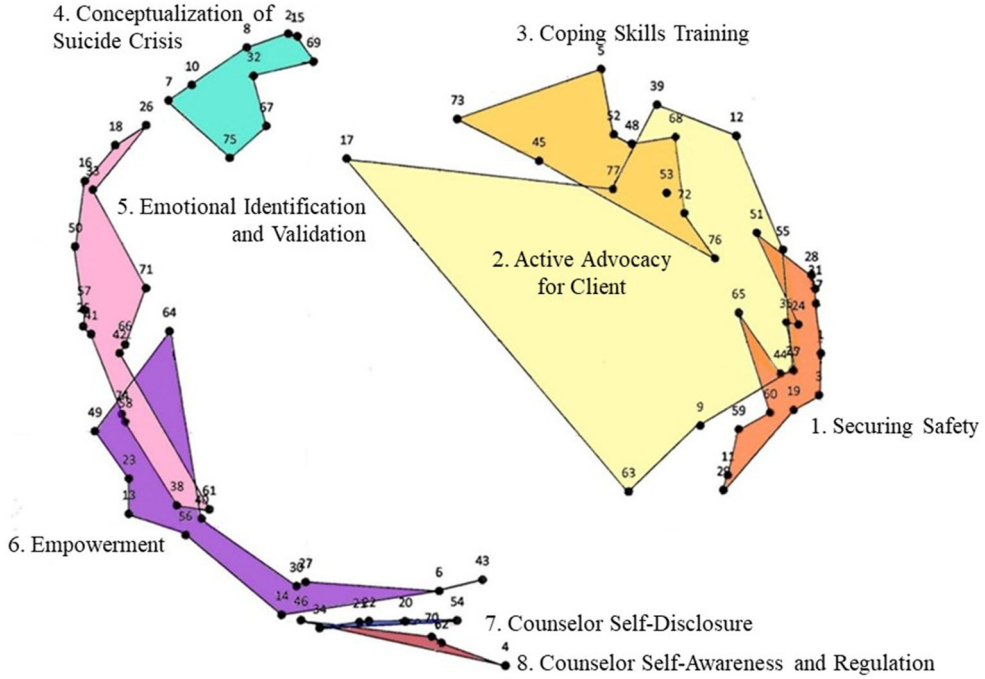

FIGURE 3 | Concept map of therapeutic interventions of suicide crisis counseling.

TABLE 2 | Importance rating mean for each cluster on therapeutic interventions.

Cluster	Average rating of importance	*SD*
Cluster 1: Securing Safety	5.59	0.70
Cluster 2: Active Advocacy for Client	5.27	0.85
Cluster 3: Coping Skills Training	5.27	0.91
Cluster 4: Conceptualization of Suicide Crisis	5.63	0.73
Cluster 5: Emotional Identification and Validation	5.54	0.58
Cluster 6: Empowerment	5.15	0.92
Cluster 7: Counselor Self-disclosure	4.91	1.08
Cluster 8: Counselor Self-awareness and Regulation	5.77	0.86

DISCUSSION

The present study used concept mapping to analyze the experienced counselors' perception of effective therapeutic interventions. The advantages of this methodology include that it fits well with an explorative stage of research questions yet to own confirmed theoretical background while minimizing the researcher's subjective viewpoint (64). Concept mapping may appear identical to qualitative methodology as it explores the participants' potential awareness; however, it is based on a statistical method for objective results (65, 66, 69, 70) as it allows quantitatively substantiated participants' conceptualizations.

The present study explored and examined 77 therapeutic interventions of suicide crisis counseling through experienced counselors with a minimum of 5 years of counseling experience and 10 counseling sessions with the clients of suicide attempts in South Korea. Through the analysis, the study discovered eight clusters on the concept map and demonstrated three important themes regarding the therapeutic interventions of suicide crisis counseling. Experienced Korean counselors practiced active and instructional intervention (Cluster 1: Securing Safety, Cluster 2: Active Advocacy for Client, Cluster 3: Coping Skills Training), understood the clients' difficulties in emotional expression and had patience in waiting, and involved with the clients' painful feelings (Cluster 5: Emotional Identification and Validation). Additionally, they had high involvement therapeutic relationships with their clients through self-disclosure and expressions for self-worthiness in their clients (Cluster 6: Empowerment, Cluster 7: Counselor Self-Disclosure, Cluster 8: Counselor Self-Awareness and Regulation).

Active and Instructional Intervention

Cluster 1 (Securing Safety), Cluster 2 (Active Advocacy for Client), and Cluster 3 (Coping Skills Training) are situated on the right side of the concept map. This indicates that they all show common characteristics of a counselor's active and instructional intervention. The counselors in Cluster 1 reported receiving promises not to commit suicide from their clients and showed firm expression against suicide as an effective therapeutic

intervention. This may appear authoritative and instructional, but it aligns with successful factors in previous research that effective counseling techniques in Korea include providing advice and instructional intervention (26, 28, 29, 32).

Cluster 3 (Coping Skills Training) indicated that the counselors tended to actively educate alternative skills such as finding alternative behaviors to suicide, effective interpersonal competency skills, and reduction of self-destructive behaviors as the therapeutic intervention. The perception of considering active education as a therapeutic intervention is also seen in Korean suicide risk factors. In the studies on suicide group with the comparison group, self-injuries, previous suicide attempts, alcohol problems, financial hardship, failure of a business, interpersonal issues with domestic partners, and other factors related to a heightened stress level were related to suicide (23). The interventions to help gain some of these proficiencies as interpersonal skills, to reduce self-destructive behaviors (e.g., alcohol abuse, dangerous sexual acts) and self-injury, appear to be effective therapeutic interventions.

Cluster 2 (Active Advocacy for Client) is located, overlapping with Cluster 1 (Securing Safety) and Cluster 3 (Coping Skills Training). This portrays the higher chances of simultaneous occurrence or more relatedness among those three clusters. When the counselors continue with the interventions of Cluster 1 (Securing Safety) and Cluster 3 (Coping Skills Training), they actively take action to advocate for their clients. Such interventions may have been influenced by the Korean counseling environment. The intervention of counselors seeking assistance from the institutions and intervention of discussing the appropriate time and method of counseling termination with the client are not reported by the suicide crisis intervention list (36–38) in western culture. The experienced Korean counselors' additional effort in these areas can be viewed as providing additional services to the clients in the absence of sufficient insurance services related to suicide crisis cases in Korea.

The most important intervention was rated for Cluster 1 (Securing Safety); providing the emergency contact number and checking for the client's safety in an emergency and helping to calm down belonged to this cluster. In particular, most participants in the study reported that they provide their personal phone numbers, demonstrating active involvement, yet it also may provide an insight into the underdeveloped counseling system in Korea. As mentioned earlier, Korea still has a short history of counseling, and the effective connections between hospital/police/emergency medical personnel are still weak. Hence, counselors often offer themselves as the emergency contact persons and perceive the need to actively handle emergencies themselves as a therapeutic intervention. The development of efficient connections in those three organization types should continue. Finding the means to check for the clients' safety and proper education on safety measures to handle dangerous clients is necessary for the interim.

Patience in Waiting for Emotional Expression Based on Empathy

According to Cluster 5 (Emotional Identification and Validation), the experienced counselors in South Korea perceived patience waiting for their clients to be able to express emotions and validating such emotions to be a highly therapeutic intervention. For instance, the participants reported understanding and sensitively responding to the clients' major emotions (e.g., extreme frustration for feeling alone) as a therapeutic intervention and had a tendency to look into co-events occurring in repeated suicidal impulses and the suicide attempt processes. They also assisted their clients by encouraging them to specifically express negative feelings, help to utilize pictures, mental images, and other various tools to express, all of which were perceived as therapeutic interventions. They reported understanding and enduring even uncooperative clients and validating their feelings and empathizing with the clients' continuous thoughts on death as an effective therapeutic intervention.

Those interventions perceived by the counselors are very unique interventions rarely listed as interventions by diagnosis and intervention capacities for suicide crisis (38, 71) recommended and developed by the Assessing and Managing Suicide Risk (AMSR), American Association of Suicidology (AAS). The results portray that many Korean clients have shown difficulties in expressing their emotions, very likely rooted in Confucian-based philosophy and communitarianism; yet assisting with their expression of emotions was considered effective counseling technique. This supports the results of a previous study that found higher effectiveness with emotional expressions as the focal point in counseling (27). Other research findings also supported that effective Korean counselors tended to understand the clients' verbal awkwardness in expressing their own problems and feelings and therefore patiently waiting for a longer time (26, 32). A study on suicide crisis of adolescent group similarly revealed that the counselors with more verbal responses acknowledging the clients' feelings and reflecting their emotions had a higher success rate in agreed termination of counseling sessions (72). Future Korean suicide crisis counseling education warrants exploring verbal inexpression nature in clients along with finding how counselors can assist with language, mental images, for instance, to encourage more verbal expressions. Also, education on staying with the devastation and holding the client's negative emotions is necessary. It is noteworthy to focus on this aspect of counseling intervention factor especially when emotional involvement is often discouraged in practice in a crisis counseling setting (73, 74).

High Involvement

Situated on the lower left side of the two-dimensional concept map, Cluster 6 (Empowerment), Cluster 7 (Counselor Self-Disclosure), and Cluster 8 (Counselor Self-Awareness and Regulation) indicate that experienced Korean counselors are engaged in deep, therapeutic relationships with their clients with high involvement. Their tendency to believe that expressing to the client as a meaningful and valuable being is an important intervention that is aligned with the Interpersonal Theory of Suicide (IPTS) described earlier. As seen in the empirical studies in previous research (12–16), abrupt socioeconomic changes in Korea are believed to have resulted in weakened social integration, a sense of isolation and burdensomeness to others in individuals, and such interpersonal factors contribute to the nation's suicide rate (7, 10, 11). Within Cluster 6

(Empowerment), counselors treat their clients with values and support with a positive attitude along with leading to cooperation after a steady rapport is established; it is identical to the findings of the western therapeutic intervention (36, 37). However, when the professional boundaries are violated, the counselors further take actions such as first accepting and supporting by being supportive partners and re-nurture upon developmental phases of the clients. Focusing on Cluster 7 (Counselor Self-Disclosure) provides another meaningful insight; Korean counselors' disclosure of their human feelings by the client's suicide impulse/attempts and expressing the client's unique values are not witnessed as effective interventions in western societies. This is to say that Korean counselors readily provide themselves as a "shelter" to their clients while enabling them to believe their value to others, perceived as an effective therapeutic intervention.

The highest score in the importance rating was for Cluster 8 (Counselor Self-Awareness and Regulation), which displays another interesting intuition. Experienced Korean counselors understood that owning a high level of involvement with the client's emotional needs inevitably was linked to countertransference and exhaustion in them. Nonetheless, they were very well aware of the importance of managing and controlling their feelings well. To avoid negative intervention caused by their own emotions, recognizing them, enduring negative and suppressing feelings, and being self-aware and regulating were considered important therapeutic interventions. Cluster 7 (Counselor Self-Disclosure) and Cluster 8 (Counselor Self-Awareness and Regulation) located near Cluster 6 (Empowerment) further denote that applying a therapeutic relationship means high involvement with disclosing self-emotions for creating a true relationship. A study of the grounded theory method revealed that inexperienced counselors initially were fearful of the client's suicidal behaviors; however, after becoming more competent at recognizing their own feelings and controlling them, their coping skills significantly increased (75). Such a high important rating score result for Cluster 8 (Counselor Self-Awareness and Regulation) signifies that self-awareness in negative, overwhelming feelings from their clients must well be controlled. This, in turn, can help reduce the clients' sense of burdensomeness and recover the sense of belongingness through a healthy therapeutic relationship with their counselor.

Implications

First, a final set of 77 statements of therapeutic intervention drawn from the present study presents a useful list that future suicide crisis counseling education may utilize in Korea. In sum, experienced Korean counselors overall perceived patiently aiding with emotional expressions, offering self as a nurturer, and self-disclosing for creating a true, therapeutic relationship as effective therapeutic interventions. Such interventions were often qualitatively different from the ones found in the western studies in suicide crisis counseling; this study realistically offers Korea-specific practical counseling components to its clients in the related area. In addition, interventions that had six or higher scores in importance rating (Statement 28, 59, 38, 31, 32, 51, 4, 76, 24, 75) may be considered as more urgently needed interventions that should be implemented quickly.

Second, the present study uniquely studied how experienced Korean counselors perceived therapeutic interventions in groups. Through the study, they perceived therapeutic interventions with eight clusters. Speculating the locations of each cluster on the concept map, more closely related clusters should be taught for educational purposes in the suicide crisis counseling curriculum in the future. For instance, Cluster 1 (Securing Safety) and Cluster 3 (Coping Skills Training) near Cluster 2 (Active Advocacy for Client) together indicate that teaching advocacy concerning clients' rights can be implemented along with educating for clients' safety and coping skills training. Likewise, when the counselors empower (Cluster 6: Empowerment) their clients through a therapeutic relationship, making sensible use of self-disclosure (Cluster 7: Counselor Self-Disclosure) and how to effectively manage counselors' own negative feelings (Cluster 8: Counselor Self-Awareness and Regulation) can be co-trained for more in-depth quality in suicide crisis counseling.

Limitations and Future Directions

The study limitations and suggestions for future studies are as follows. First, the present study relied on the experienced counselors' self-reports only on the clients with "suicide attempts with suicide intention" as any clinical scale was lacking in the Korean suicide crisis counseling setting. Yet, an objective clinical scale for the measurement of suicide crisis in at-risk clients will be beneficial for future studies. Second, the present study examined the perception of the experienced counselors on effective therapeutic intervention in suicide crisis counseling, which may be different from the perceptions of the clients. Therefore, future studies may investigate effective therapeutic interventions perceived by the clients and follow up with any observable episodes, such as a reduced number of suicide ideations or attempts to measure the results on the clients' side. Third, this study considered Korea's short counseling history and defined experienced counselors as "with a minimum of 5 years of counseling in the field and 10 completed sessions of counseling in a suicide crisis." It must be noted that experienced counselors do not always reflect that they are "experts" in the field (76). Future studies can adjust and meet more fine definitions for suicide crisis counseling experts as their study participants in Korea and abroad. Fourth, this study had enough participants as concept mapping methodology requires; however, it is still recommended that the results be interpreted with caution and be generalized from the selected participants in this study.

CONCLUSION

The present study examined experienced South Korean counselors' perceptions on therapeutic interventions in preventing or delaying completed suicide using concept mapping methodology and provided a visual representation of its results. A total of 77 final statements from 15 study participants were extracted and their perceptions were grouped into 8 major

clusters on a two-dimensional model. The interpretations of cluster locations and importance rating results of this study are expected to contribute as an educational foundation for suicide crisis intervention programs for counselors in the field. A broader understanding of the necessities related to the clients' needs, beyond the Korean client population, in suicide crisis counseling and strengthening suicide crisis intervention competence in counselors for ultimate suicide prevention are further encouraged.

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

The studies involving human participants were reviewed and approved by Institutional Review Board of Seoul National University (IRB No. 1906/003-015). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AP and DK: conceptualization and methodology. AP, DK, and HS: validation and writing—review and editing. AP: formal analysis, investigation, visualization, data curation, and project administration. AP and HS: resources and writing—original draft preparation. DK: supervision. All authors have read and agreed to the published version of the manuscript.

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BRIEF RESEARCH REPORT
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COVID-19 Exposure, Stress, and Mental Health Outcomes: Results From a Needs Assessment Among Low Income Adults in Central North Carolina

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This study focuses on identifying COVID-19 related exposure, stress, and mental health concerns in the larger Charlotte, North Carolina region, an area with many low-income and under resourced communities. A community-academic partnership conducted a regional COVID-19 needs assessment. Low-income adults ($N = 156$) completed an online-administered survey of demographic information, COVID-19 exposure, stress, coping-related factors, and mental health. Frequency data showed that common COVID-19 related stressors included job exposure, lost job/income, and increased home responsibilities. Frequency data further showed elevated screening risk rates for mental health concerns were observed for post-traumatic stress (83.3%), depression (52.2%), problematic drinking (50.0%), generalized anxiety (43.0%), and suicide (40.4%). Bivariate correlation and multivariate regression models identified robust mental health risk factors including COVID-19 related stress affecting close persons, fear/worry reaction to the pandemic, and use of venting as a coping strategy; protective factors included active coping and problem-focused coping beliefs. Findings are discussed with respect to informing regional public health efforts during the pandemic.

Keywords: COVID-19, coping, stress, mental health, suicide

In January 2020, the novel coronavirus (COVID-19) was declared a public health emergency in the United States after the World Health Organization reported the spread of the virus as an international problem (1). As of September 2021, an estimated 220 million cases were documented worldwide, including over 650,000 deaths in the United States alone (2). In addition to proximal COVID-19 symptoms and death, the pandemic and associated public health interventions (e.g., home-confinement, social distancing) have resulted in psychosocial and mental health impacts (3). As such, the International COVID-19 Suicide Prevention Research Collaboration released a global call to action anticipating rising adverse mental health effects due to the ongoing pandemic (4). The present study contributes to that call through a focus on vulnerable, low-income adults in an urban region of the southern United States.

WHAT DO WE KNOW ABOUT STRESS, BEHAVIORAL RESPONSES, AND MENTAL HEALTH IN PANDEMICS?

Globally, rates of mental disorders (e.g., depression, anxiety, post-traumatic stress disorder) are a concern, with a prevalence of approximately 22% (5); further, low-income individuals are at increased risk of mental health disorders and suicide attempts (6). Public health emergencies may exacerbate rates of negative mental health outcomes. Individuals and communities experiencing public health emergencies may endure a number of emotional and behavioral stressors and behavioral impacts, including increased distress or mental health conditions, and increased substance use (7). For example, survey data suggests that quarantine, isolation, and other social distancing measures during pandemic-focused disasters are associated with stress and the risk for post-traumatic stress disorder (8). In Singapore, one study identified increased rates of psychiatric symptoms (e.g., post-traumatic effects) ranging between 22.9 and 25.8% among the general population (9). The long-term mental health outcomes following the 2009 influenza strain H1N1 (i.e., swine flu) pandemic included increased rates of anxiety, depression, and a greater risk for post-traumatic stress disorder (10).

Recent studies similarly indicate that poor mental health outcomes may be associated with the ongoing COVID-19 pandemic (3, 11, 12). Globally, rates of mental health issues, including depression, anxiety, and post-traumatic stress (PTS) increased during the initial months of the COVID-19 pandemic compared to pre-pandemic rates (13, 14). Further, besides PTS, the pandemic has been linked with increased feelings of apprehension, boredom, anger, fear, uncertainty, loneliness, stress, anxiety, and suicide ideation (14–17). For instance, interviews with college students in the United States showed an escalation in rates of stress and anxiety during the pandemic (18). Both the virus and associated safety guidelines represent stressors, with extended periods of social distancing straining mental health (15, 19). For example, findings early on in the pandemic (March 2020), suggested that social distancing was linked with worse mental health (e.g., symptoms of depression, anxiety, insomnia, and acute stress) (20). Other documented stressors associated with the pandemic include financial difficulties, fear of becoming physically ill, and concern about accessing mental health resources (21–24).

Repeated exposure to global media coverage related to the virus and social distancing can also perpetuate stress and anxiety and influence noncompliance of public health directives (e.g., mask mandates), leading to absence of help-seeking behaviors (25). In terms of reactions to the pandemic and its media coverage, research conducted in multiple countries demonstrates adverse mental health impacts including sleep disturbance, attention difficulties, extreme increased substance use, less social interaction, and increased social isolation, as well as lowered perceived physical health (18, 26).

Understanding how these stressors interact with known social risk factors is critical to understanding the mental health impact of the pandemic. Studies of the impact of COVID-19 on mental health have largely focused on samples of convenience or have focused on specific occupational groups (e.g., medical staff) or medically vulnerable populations. However, low socioeconomic status is a critical social risk factor that may heighten the risk for negative mental health outcomes, warranting research with low socioeconomic status populations. For example, longitudinal research indicates that overall depressive symptoms among U.S. adults increased from early in the pandemic compared to 1 year later, with low household income exacerbating depressive symptoms (27). An important aim of the present study is to examine a range of stressors attributed to COVID-19 among individuals who are disproportionately affected by socioeconomic systems that lead to poverty.

Emerging evidence suggests the pandemic may result in both helpful and unhelpful coping strategies (e.g., venting, active coping, substance use) (23, 24). Documented efforts to cope with pandemic-related stress include positive (e.g., social support, mindfulness) and negative (e.g., substance use, social withdrawal) coping techniques (28, 29). For example, healthy (e.g., mindfulness) and unhealthy (e.g., sleeping longer) self-management strategies and seeking social support were common among college students grappling with the pandemic (18). An additional aim of this study is to quantify COVID-19 related exposure and stress, especially as they relate to the mental health and coping of adults with lower incomes in the Southern United States.

WHY CENTRAL NORTH CAROLINA?

Central North Carolina (NC), including Charlotte and its surrounding areas, has a deep history of social and economic inequality. Approximately 14% of the region lives both below the poverty line and without health insurance (30). More than 50% of the region are people of color, with over 30% identifying as African American and another 14% as Hispanic. In addition, at least 15% are immigrants and refugees. Thus, a substantial proportion of the population is exposed to socioeconomic systems that lead to poverty, institutional racism, and discrimination that targets Black, Indigenous People of Color (BIPOC), and socio-political policies that target undocumented immigrants, all of which may heighten the negative impact of the pandemic on mental health and/or poor coping strategies. Indeed, findings show that the COVID-19 pandemic has disproportionately affected members of low-income and urban communities of color (31, 32), likely exacerbated by pre-existing and ongoing social, health, and economic inequities. The demographic diversity of central NC leaves the area particularly vulnerable to long-lasting negative impacts of COVID-19. In NC, more than 31,000 people are estimated to be at risk of complications due to COVID-19, with patterns worse for racially and ethnically minoritized groups and those without health insurance (33). BIPOC individuals are more likely to have pre-existing conditions such as asthma or diabetes, and are more likely to work jobs deemed essential, increasing their likelihood of exposure to SARS-CoV-2, and ultimately leading to higher rates of COVID-19 mortality (34, 35). The demographic, financial,

and social composition of central NC raises concern about the long-term impact of the local COVID-19 pandemic.

The broader public health research literature helped us identify starting points for this COVID-19 needs assessment. For instance, a June 2020 CDC study regarding mental health during the pandemic showed that 40% of those surveyed reported struggling with mental health or substance use (36). Specifically, 31% of individuals reported symptoms of anxiety/depression, 26% indicated having a trauma-related concern, 13% started or increased substance use, and 11% considered suicide. Further, substance abuse and suicidal ideation frequencies were higher among young adults and members of racial/ethnic minority groups. The COVID-19 pandemic has resulted in the publication and dissemination of numerous professional organization resource pages on stress, coping, and related matters (37, 38). However, studies that evaluate both COVID-19-related stress and exposure, as well as coping and biopsychosocial responses, are needed to understand the mental health needs of low socioeconomic status adults in the central NC region. Doing so offers the possibility of developing a tailored intervention program specific to the region's needs.

THE PRESENT STUDY

Groups that have been economically and socially marginalized in the central NC region may disproportionately experience stress, negative reactions, and psychological disruptions caused by COVID-19. Among low-income adults in the central NC region, the aims of this community-engaged needs assessment were:

Aim 1: To quantify COVID-19 specific exposure, stress, and responses.
Aim 2: To assess levels of mental health concerns and coping strategies and beliefs.
Aim 3: To identify COVID-19 and coping-related risk and protective factors for mental health outcomes.

MATERIALS AND METHODS

Community-Engaged Partnership

This study was conducted with help from a community-academic partnership (39). Psychology for All (40) is a Charlotte area non-profit aimed at reducing barriers to mental health services for people with lower incomes. The university team comprised community-focused researchers in public health, psychology, and social work. Consistent with community-academic partnership principles (39), problem identification was aimed at helping solve pandemic and health-related problems of interest to constituent partners. This project served as an initial needs assessment to inform community action and public health program development.

Procedure

University investigators obtained Institutional Review Board approval for this assessment. Data were collected in late July of 2020. Convenience sampling was used *via* an online Qualtrics-administered self-report survey constructed for distribution by Psychology for All (40) and its constituent community partners *via* email listserv and social media distribution. Importantly, the following partners all serve ethnic, racial and/or sexual minority groups and people experiencing poverty. We engaged with these partners specifically to reach groups disproportionately experiencing health disparities in Charlotte, NC. Partners sharing the survey opportunity were C4 Counseling, The Harvest Center, Care Ring, Time Out Youth, Westside Education Think Tank, and UNC Charlotte School of Social Work field education partners (41–46). Psychology for All distributed a standard email advertisement of the survey to individual administrative contacts at each constituent partner. Partners shared the email advertisement, which included study goals, participant risks/benefits and the survey link, to their respective clientele. Response rate could not be tabulated because partners did not report back overall listserv sizes.

The informed consent contained information about the study aims, procedure, investigators and contact information, participant rights, and renumeration details. Potential participants indicated consent by selecting "yes" for their willingness to participate in the online consent form. Potential participants first completed the study screener to confirm study eligibility criteria of (1) 18 years of age or older, (2) annual household income of $60,000 or less, and (3) resident in Charlotte-Mecklenburg or surrounding counties (i.e., Gaston, Lincoln, Cabarrus, and Union). The screener survey immediately ended if a potential participant did not meet study inclusion criteria. All subsequent measures (see below) were presented in randomized order, so as to avoid response set effects. Information regarding Psychology for All's online therapy service application, *Psychology Today*'s mental health provider locator, and national crisis phone and text line were given on each survey page and in consent/debriefing documents. Upon survey completion, participants were provided with a written debriefing page. They were also offered the opportunity to provide an email address and preference for a $20.00 Amazon or Walmart e-gift card. The survey took approximately 15–20 min to complete.

Participants

Online Supplement 1 contains a demographic summary. Participants ($N = 156$) were primarily from Charlotte/Mecklenburg or Lincoln County and were born in the United States. Most participants were either White or Black/African American, between 36 and 55 years of age ($n = 91$; 58.3%), and identified evenly as either men ($n = 79$; 51.0%) or women ($n = 75$; 48.4%). Further, the majority of participants were employed either full or part-time, had an Associate's degree or less, and were insured.

Measures

Demographics

A demographics form first screened participants for age, annual household income, and county of residence, followed by gender, race, ethnicity, insurance status, education level, employment status, and whether the person had been advised to see a mental health provider.

COVID-19 Exposure, Stress and Responses

COVID-19 exposure and adjustment measures developed for community research use by the Department of Veterans Affairs were used in the present study. The Coronavirus Stress Survey (47) comprises 10 binary response (i.e., no/yes) questions capturing virus exposure, illness, and difficulties (e.g., medical challenges, familial responsibilities) associated with COVID-19, as well as COVID-19 media exposure. Respondents indicated whether the events happened to themselves and/or someone they know. A total score was tabulated each for personal and other known person stressors. Internal consistency values (Cronbach's α) for the respective COVID-10 stress self (0.54) and other (0.56) values were low. The Coronavirus Response Scale-10 (CRS-10) (48) assesses specific domains of impact such as pain, social support, physical activity, and emotional distress. Items are scored and used individually.

Depressive Symptoms

The Patient Health Questionnaire-2 (PHQ-2) (49) is a two-item screening tool used to assess depressed mood and little interest/pleasure in activities. Items are indicated on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). Items are summed to provide both total and cut scores (>3) to identify those at risk for severe depression. Internal consistency (Cronbach's α) in the present sample was 0.64. As a screening tool for major depressive disorder, the PHQ-2 cut off score demonstrates high sensitivity (83%) and specificity (92%). Additionally, scores on the PHQ-2 are associated with mental health and social and physical functioning (49).

Anxiety Symptoms

The Generalized Anxiety Disorder-7 (GAD-7) (50) is a seven-item questionnaire capturing seven domains of anxiety symptoms (e.g., feeling nervous, worrying). Items are indicated on a 4-point Likert scale ranging from 0 (not at all) to 3 (nearly every day). Responses are summed for a total score, which is subsequently classified into four severity categories and a clinical cut-off score (≥10). Internal consistency (Cronbach's α) for the total score in the present sample was 0.79. The GAD-7 demonstrates excellent internal consistency (Cronbach's α) among general population samples (α = 0.92) and the sensitivity (89%) and specificity (82%) of the clinical cut-off are high. Scores on the GAD-7 are significantly positively correlated with other anxiety scales, including the Beck Anxiety Inventory (50).

Suicide Risk

The Suicidal Ideation Attributes Scale (SIDAS) (51) contains five items assessing suicidal thinking, controllability, and impact. Items are indicated on a variably anchored 11-point Likert scale. Responses are summed to provide a total and cut score (>21) for identification of those at risk for suicide. The SIDAS demonstrates excellent internal consistency among community samples (α = 0.91) and the cut-off score has excellent specificity in identifying individuals at risk of suicidal behavior. Internal consistency (Cronbach's α) in the present sample was 0.92. Additionally, items on the SIDAS are significantly positively associated with other measures of suicidal ideation, such as the Columbia Suicide Severity Scale, as well as measures of depression (PHQ-9) and anxiety (GAD-7) (51).

Post-traumatic Stress Disorder (PTSD) Symptoms

The Post-traumatic Checklist-2 (PCL-2) (52–54) is a two-item screener of key post-traumatic symptoms (e.g., intrusive thoughts/images). The 2-item version of the PCL contains the two items from the longer PCL-6 that were most correlated with total score (53). Responses are indicated on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). Responses are summed to provide a total score and cut score (≥4) for identifying probable PTSD diagnosis. Internal consistency (Cronbach's α) for the total score in the present sample was 0.69. The sensitivity of the PCL-2 cutoff in identifying individuals with PTSD is high (0.97) (52).

Problematic Drinking

The Alcohol Use Disorders Identification Test-C (AUDIT-C) (55) is a three-item inventory assessing problematic alcohol use (e.g., frequency of binge drinking). Items are indicated on a 5-point variably anchored Likert scale ranging from 0 to 4. Responses are summed, providing a summed score and cut-score (≥4 for men; ≥3 for women) to identify individuals at risk for alcohol abuse. Internal consistency (Cronbach's α) for the total score in the present sample was 0.52. The AUDIT-C is significantly correlated with other measures of hazardous drinking (56). Further, the AUDIT-C demonstrates acceptable internal consistency (α = 0.70) (57) and is effective in screening for alcohol abuse/dependence (sensitivity = 0.88) (55).

Coping and Resilience

The Brief COPE (58) is a 28-item measure containing 14 coping style subscales. We selected three items to assessing venting, active coping, and reframing coping styles. As indicated in the original publishing of the scale, the full instrument does not need to be administered and items and scales can be selected for administration (58). Internal consistency (Cronbach's α) values for Brief COPE subscales used in the present sample were 0.62 for active coping, 0.23 for venting, and 0.59 for positive reframing. The Coping Self-Efficacy Scale (59) was used to assess three areas of beliefs about one's ability to use the following coping strategies: thought stopping, problem-focused coping, and getting social support. Items are indicated on an 11-point Likert scale ranging from 0 (I cannot do this at all) to 10 (I'm certain that I can do this) and summed for a total score. Internal consistency of the CSE subscales is good (thought stopping: α = 0.91, problem-focused coping: α = 0.91, getting social support: α = 0.80). Additionally, CSE subscales are associated with measures of psychological distress (e.g., anxiety, perceived stress), well-being (e.g., optimism), social support, and ways of coping. CSE subscale internal consistency values (Cronbach's α) in the present sample were 0.92 for problem-focused coping, 0.91 for thought stopping, and 0.93 for getting social support. Finally, the Connor-Davidson Resilience Scale−2 item (CD-RISC2) (60) served as a screener for participants' ability to bounce back from difficult circumstances. The CD-RISC2 is significantly negatively correlated with perceived stress and with overall score on the

TABLE 1 | Correlation matrix of COVID-19 related stress and responses, coping factors, and mental health outcomes.

MH correlate	Depression	SI	PTS	Anxiety	Alcohol use	α
COVID-19 stress–self total	0.16	−0.08	0.15	0.03	0.01	0.56
COVID-19 stress–other total	**0.32**	**0.37**	**0.21**	**0.30**	**0.46**	0.54
CRS-10 stress response	***0.17***	***−0.21***	***0.26***	0.12	−0.09	-
CRS-10 interaction with friends and family	−0.02	−0.03	−0.08	**−0.24**	−0.02	-
CRS-10 emotional distress response	**0.31**	0.04	***0.21***	***0.17***	0.10	-
CRS-10 physical activity	***0.18***	**0.32**	0.09	***0.18***	***0.18***	**-**
CRS-10 use of alcohol and illicit drugs	**0.37**	**0.36**	**0.35**	**0.35**	**0.42**	**-**
CRS-10 use of prescription medication	***0.21***	**0.43**	***0.22***	***0.23***	***0.26***	**-**
CRS-10 pain	**0.33**	**0.34**	**0.36**	**0.29**	***0.25***	**-**
CRS-10 fear or worry	**0.28**	0.03	**0.43**	**0.36**	0.15	-
CRS-10 effort to cope with stress	***0.19***	0.04	***0.26***	0.14	0.01	-
CRS-10 overall sense of well-being	0.02	0.12	0.12	0.01	0.14	-
Brief resilience	−0.14	***−0.29***	***−0.16***	**−0.29**	***−0.22***	0.73
Active coping	−0.06	**−0.43**	−0.03	−0.11	**−0.29**	0.62
Venting	***0.23***	***0.25***	**0.34**	**0.31**	0.13	0.23
Positive reframing	−0.10	***−0.29***	−0.09	−0.07	−0.15	0.59
Problem-focused coping beliefs	***−0.26***	**−0.40**	−0.13	**−0.33**	***−0.25***	0.92
Thought stopping beliefs	−0.15	***−0.24***	−0.05	***−0.17***	−0.05	0.91
Getting social support beliefs	−0.09	***−0.30***	−0.04	−0.14	−0.08	0.93
α	0.65	0.91	0.69	0.79	0.52	-

Bold font denotes $p < 0.001$; Bold italics font $p < 0.05$.

MH, mental health; SI, suicidal ideation; PTS, post-traumatic stress symptoms; Anxiety, generalized anxiety symptoms; COVID-19 Stress, Coronavirus Stress Survey Total Score (Self or Other); CRS-10, Coronavirus Response Scale-10.

full CD-RISC (60). Internal consistency (Cronbach's α) for the CD-RISC2 total score was 0.73 in the present sample.

Internal consistencies for the current study are reported in **Table 1**.

Data Analysis

Aim 1 and Aim 2 analyses were accomplished using simple frequency counts. Total mental health outcome scores were converted to categories using clinical cut-score values summarized in the measures section. Bivariate correlations were used as the first analytic step in Aim 1 in order to identify bivariate risk and protective factors of mental health outcomes. Following guidelines in the literature (61), multivariate regression was then employed to (a) select demographic covariates of mental health outcomes, and (b) identify the most robust risk and protective factors for mental health outcomes.

RESULTS

COVID-19 Specific Exposure, Stress, and Responses

Table 2 contains results from the Coronavirus Stress Survey. Less than one-third of participants reported direct exposure or illness, but almost three-quarters reported knowing someone close who was affected by COVID-19. The most common self-reported coronavirus-related stressors were job exposure, lost job/income, and increased home responsibilities. The most common reported stressors for known close persons were lost job/income, increased home responsibilities, and difficulties getting basic necessities (e.g., medication). A total of 83.4% of the sample reported consuming one or more hours per day of COVID-19 related media information (e.g., TV, Twitter, Facebook).

TABLE 2 | Self- and other-experienced COVID-19 related exposure and stressors.

Coronavirus related experience	Happened to me–*n* (%)	Happened to someone close to me–*n* (%)
1. Become ill from possible or certain exposure to the coronavirus	46 (29.5%)	111 (71.2%)
2. Job requires possible exposure to coronavirus	73 (46.8%)	65 (41.7%)
3. Lost job or lost income due to the coronavirus pandemic	72 (46.2%)	84 (53.8%)
4. Increased responsibilities at home due to the coronavirus pandemic	73 (46.8%)	88 (56.4%)
5. Difficulty getting food, medication or other necessities due to the coronavirus pandemic	52 (33.3%)	76 (48.7%)
6. Difficulty getting needed social support due to the coronavirus pandemic	64 (41.0)%	71 (45.5%)
7. Lost health insurance due to the coronavirus pandemic	40 (25.6%)	70 (44.9%)
8. Went on public food assistance due to the coronavirus pandemic	54 (34.6%)	62 (39.7%)

TABLE 3 | Mental health and coping-related descriptive statistics.

Mental health or coping related factor	*M* (*SD*)	Mean score label	*n* (%) above cut score suggesting increased risk	Interpretation of elevated risk
Depression	2.47 (1.46)	No risk	83 (52.2%)	Probable risk for depression
Suicidal thinking	14.62 (11.50)	No risk	63 (40.4%)	Elevated suicide risk
Post-traumatic stress	5.61 (1.82)	Possible PTSD	130 (83.3%)	Possible PTSD
Anxiety	8.09 (4.02)	Moderate anxiety	67 (43.0%)	Moderate or worse
Alcohol use - men[a]	3.39 (1.50)	No risk	40 (50.6%)	Problematic drinking
Alcohol use – women	2.67 (1.91)	No risk	38 (50.0%)	Problematic drinking
Resilience	3.38 (0.88)	Neutral	-	-
Active coping	2.69 (0.70)	Doing a medium amount	-	-
Venting	2.49 (0.70)	Doing a little bit	-	-
Positive reframing	2.77 (0.75)	Doing a medium amount	-	-
Problem-focused coping beliefs	5.24 (2.07)	Moderately certain I can do this	-	-
Thought stopping beliefs	5.26 (2.18)	Moderately certain I can do this	-	-
Getting social support beliefs	5.49 (2.26)	Moderately certain I can do this	-	-

M, mean; SD, standard deviation; PTSD, Post-traumatic stress disorder.
[a]*AUDIT-C requires breakdown by gender for use of cut-scores.*

A total of 85 participants provided narrative responses regarding additional COVID-19 related concerns. Responses fell into the following categories (a respondent could provide more than one type): job or financial loss ($n = 14$); decreased socialization or being stuck at home ($n = 13$); personal mental health or negative mood ($n = 9$); job pressures ($n = 5$); no school for kids ($n = 5$); know someone who died of COVID-19 ($n = 5$); having to engage in preventive practices (e.g., wearing a mask) ($n = 4$); and child rearing ($n = 4$). Common responses to the Coronavirus pandemic were cataloged using the CRS-10 items (see **Table 1** for items). Descriptive patterns were similar for all 10 items, with average scores falling approximately at the mid-point (M_{range} =2.66 to 3.24, SD_{range} =0.96 to 1.16). These scores reflect responses to the pandemic as "about the same" as compared to before the pandemic.

Mental Health Concerns and Coping-Related Strategies

Table 3 contains descriptive summaries for mental health outcomes and coping-related scales. Scores on PTSD and generalized anxiety screeners indicate elevated levels among this sample. Clinical cut scores derived from source articles (see measures section) show concerning rates of probable risk (in descending order) for post-traumatic stress, depression, problematic drinking, generalized anxiety, and suicide risk. With the exception of venting, participants reported scale midpoint levels of all coping-related factors. Venting was used less than the midpoint.

COVID-19 and Coping-Related Risk and Protective Factors for Mental Health Outcomes

Table 1 contains a bivariate correlation matrix of the following factors related to mental health outcomes: (1) all summed COVID-19 stress survey scores for self and other (both derived from items on **Table 2**, score range 0–8); (2) HCRS-10 items; and (3) coping-related factors. Correlates most robustly related to better mental health outcomes included resilience and problem-focused coping beliefs. The strongest correlates of negative mental health outcomes were COVID-19 related stress others (Coronavirus Stress Survey–others subscale); responses to the pandemic–physical activity level, pain, alcohol/drug use, prescription medication use, fear/worry (CRS-10 items); and the coping domain of venting.

Prior to evaluating bivariate correlates of mental health outcomes, we sought to identify necessary demographic covariates. Due to low cell sizes in many categories, demographics were recoded for regression analyses: gender (1 = male, 2 = female [1 'other' dropped']), age (1 = 18–35, 2 = 36+), county (1 = Charlotte/Mecklenburg [the inner lying urban county], 2 = other), race (1 = White, 2 = racial minority), ethnicity (1 = Non-Hispanic; 2 = Hispanic or other minority), education (1 = High school/GED or less, 2 = Associate's Degree or higher), and employment status (1 = employed, 2 = unemployed or retired). Binary demographic variables were entered into a multivariate regression model with all mental health outcomes included. Demographics with significant overall multivariate effects on mental health outcomes were retained as control variables for further analysis. Only gender (Wilks' λ =0.86, F[5, 132] = 4.45, $p = 0.001$), county (Wilks' λ =0.91, F[5, 132] = 2.70, $p = 0.02$), and employment status (Wilks' $\lambda = 0.89$, F[5, 132] = 3.16, $p = 0.01$) were retained for further analyses.

A multivariate regression model was constructed to identify the most robust risk and protective factors of mental health outcomes. The model featured outcomes of depression, suicidal ideation, post-traumatic stress, generalized anxiety, and alcohol use (rs range = 0.30 to 0.61, ps < 0.001). COVID-19 stress and response as well as coping-related factors displaying

TABLE 4 | Multivariate* regression model statistics predicting mental health outcomes.

Predictor	Wilks' λ	F (df)	*p*-value	η_p^2
Intercept	**0.09**	**270.30 (5, 127)**	**<0.001**	**0.91**
Gender	0.92	2.28 (5, 127)	0.05	0.08
County	0.99	0.40 (5, 127)	0.85	0.01
Employment status	**0.88**	**3.33 (5, 127)**	**0.008**	**0.11**
COVID-19 stress (other)	**0.82**	**5.59 (5, 127)**	**<0.001**	**0.18**
HCRS-10 Stress Response	0.92	2.13 (5, 127)	0.07	0.08
HCRS-10 Emotional Distress	0.93	1.77 (5 127)	0.12	0.06
HCRS-10 Physical Activity	0.98	0.57 (5, 127)	0.72	0.02
HCRS-10 Use of Alcohol/Drugs	0.93	2.01 (5, 127)	0.08	0.07
HCRS-10 Use of Prescription Medication	0.94	1.71 (5, 127)	0.14	0.06
HCRS-10 Pain	0.97	0.72 (5, 127)	0.61	0.03
HCRS-10 fear/Worry	**0.83**	**5.15 (5, 127)**	**<0.001**	**0.17**
HCRS-10 Effort to Cope with Stress	0.98	0.54 (5, 127)	0.75	0.02
Resilience	0.97	0.78 (5, 127)	0.57	0.03
Active coping	**0.89**	**3.17 (5, 127)**	**0.01**	**0.11**
Venting	**0.83**	**5.01 (5, 127)**	**<0.001**	**0.16**
Problem-Focused coping beliefs	**0.91**	**2.51 (5, 127)**	**0.03**	**0.09**
Thought Stopping Beliefs	0.98	0.48 (5, 127)	0.79	0.02

Bold font denotes significant multivariate predictor.

HCRS-10, Hilgeman Coronavirus Response Scale-10.

**Multivariate analyses allow for inclusion of multiple dependent variables in one model and provide overall omnibus tests for each predictor*[61].

As such, statistics in the table are for the overall multivariate effect on the collection of mental health outcomes. Outcome specific model effects were as follows: Depression model: $F(17, 131) = 4.60$, $p < 0.001$, Adj. $R^2 = 0.29$; Suicidal ideation model: $F(17, 131) = 8.86$, $p < 0.001$, Adj. $R^2 = 0.47$; Post-traumatic stress model: $F(17, 131) = 4.85$, $p < 0.001$, Adj. $R^2 = 0.31$; Generalized anxiety model: $F(17, 131) = 6.88$, $p < 0.001$, Adj. $R^2 = 0.40$; Alcohol use model: $F(17, 131) = 5.57$, $p < 0.001$, Adj. $R^2 = 0.34$.

significant correlations with two or more mental health outcomes (see **Table 1**) were included as main effect predictors in the multivariate model. Gender, county, and employment status were demographic covariates. This resulted in a final set of regression model predictors of: gender, employment status, county, COVID-19 Stress (other), stress response, emotional distress, physical activity, use of alcohol/drugs, use of prescription medication, pain, fear/worry, effort to cope with stress, brief resilience, active coping, venting, problem-focused coping beliefs, and thought stopping beliefs. **Table 4** contains multivariate test statistics for each predictor; only significant multivariate predictors were inspected as univariate risk or protective factors. Significant multivariate predictors (moderate-to-large effects) were employment status, COVD-19 related Stress (other), fear/worry reaction to the pandemic, active coping, venting, and problem-focused coping beliefs. Significant risk and protective factors by mental health outcome were as follows:

(1) Depression model: COVID-19 Stress (other) ($B = 0.29$, se$B = 0.12$, $p = 0.01$); venting ($B = 0.23$, se$B = 0.11$, $p = 0.04$); problem-focused coping beliefs ($B = -0.53$, se$B = 0.19$, $p = 0.007$).
(2) Suicidal ideation model: COVID-19 Stress (other) ($B = 1.69$, se$B = 0.79$, $p = 0.03$); active coping ($B = -2.69$, se$B = 0.82$, $p = 0.001$); venting ($B = 2.84$, se$B = 0.77$, $p < 0.001$).
(3) Post-traumatic stress model: Fear/worry response ($B = 0.58$, se$B = 0.16$, $p < 0.001$); venting ($B = 0.49$, se$B = 0.14$, $p = 0.001$).
(4) Generalized anxiety model: Employed ($B = 1.84$, se$B = 0.76$, $p = 0.02$); COVID-19 stress (other) ($B = 0.67$, se$B = 0.30$, $p = 0.02$); fear/worry response ($B = 1.41$, se$B = 0.33$, $p < 0.001$); problem-focused coping beliefs ($B = -1.42$, se$B = 0.49$, $p = 0.005$).
(5) Alcohol use model: COVID-19 stress (other) ($B = 0.53$, se$B = 0.13$, $p < 0.001$).

DISCUSSION

The current study was developed in response to the global call to action of the COVID-19 suicide prevention research collaboration (4). The present study contributes to that call by gaining a picture of stress and mental health among low-income adults in central NC. First, we examined the prevalence of clinically elevated mental health and suicide risk scores at the height of the pandemic. Next, we assessed how COVID-19 related exposure and responses were associated with mental health and suicide outcomes among adults with lower incomes. Findings from the present study indicate increased needs for mental health care and services in the region. We observed elevated rates of probable risk or need for further evaluation for post-traumatic stress, depression, problematic drinking, generalized anxiety, and suicide. The rates of mental health outcomes in the current sample were elevated compared to pre-pandemic global prevalence rates (5). Additionally, the rates of mental health challenges observed within our sample of NC adults are higher

than national trends in the CDC report at a similar point in time (36). While measurement differences between the CDC report and our study may explicate varying mental health and substance use rates, it is also possible that the individuals in our low-income NC sample face additional layers of stress that amplify mental health and substance use outcomes. However, given that our rates were obtained *via* use of very brief screening instruments, further evaluation from licensed healthcare providers would be necessary for formal diagnosis.

A variety of COVID-19 stressors and problematic responses were observed. We observed high rates of COVID-19 illness and exposure. Common stresses resulting from the COVID-19 pandemic included job/financial loss, increased home responsibilities, and difficulties with basic necessities (e.g., getting medication). Such stressors ranged from 26 to 47% of the sample, with higher rates of some stressors among other known persons (see **Table 2**). Open-ended responses illuminated additional impacts such as decreased socialization and negative emotions. Themes of pandemic-driven financial stress, socialization difficulties, fear of illness, and concerns about mental health are consistent with prior literature (18, 21–23). Finally, the fact that CRS-10 items were positively correlated with many mental health concerns suggests that stress responses may reflect ineffective coping strategies (e.g., physical activity) or additional symptoms of stress reactions to the pandemic (e.g., pain).

The third study aim concerned identifying pandemic-related risk factors for reduced mental health outcomes. Extending existing literature highlighting the overall severity of fear and worry during the pandemic (11, 62), COVID-19 related fear/worry was also a prominent risk factor for post-traumatic stress and anxiety symptoms in particular. Further, our correlational and regression findings suggest that knowing someone else struggling with COVID-19 related stress was more problematic for personal mental health than one's own exposure or stress. This fact is pivotal to understanding the regional effects of the pandemic. Other salient mental health risk factors included a venting coping style (for both symptoms of depression and post-traumatic stress). Consistent with a few national studies (23, 24), active coping and problem-focused coping beliefs show some promise as protective factors for depression and suicide risk, respectively, during the pandemic.

Limitations

This study possesses several clear limitations that temper conclusions and recommendations. Convenience sampling *via* online methods placed an obvious limitation on who could be reached for the needs assessment. Further, the sample was intentionally restricted by certain demographics, and the racial composition was unclear due to a survey readability concern (see **Online Supplement Note**). Additionally, the sample size of the current study was small. Moreover, we could not calculate a survey response rate due to absence of the total possible population reached with the study advertisement. Thus, generalizability to the full region is quite restricted. Also, as is often the case with intentionally brief clinical screening instruments (e.g., PHQ-2, COVID-19 stress, Brief COPE screeners), internal consistency was low for several measures. Psychometric research suggests that a low number of items (four or less) can cause low internal consistency. Low reliability offers a potential explanation of any non-significant findings in the present study because low internal consistency limits the ability to detect correlations with other measures. This limitation does not, however, render the screening tools useless in applied/field public health research. The benefit of short screeners is real world efficiency in identifying persons who may be at risk for a number of clinical conditions or stress coping problems, and to evaluate those relationships among the persons who need assistance. Future research, program evaluation, and follow-up in this area should employ longer clinically-relevant mental health and coping tools. Finally, the online data collection administration may have limited survey access; although many people in urban areas are connected to the Internet, prioritizing populations who may experience financial and technological resource deficits compromised our ability to reach the full scope of community partners. Although we employed a community-engaged strategy, further community partnerships with local faith and other community leaders and agencies can expand additional needs assessments and follow-up public health programming.

Public Health and Research Implications

Findings from this study suggest possible avenues for a regional public health strategy to address the adverse mental health effects of the pandemic in the Charlotte, NC region. A public health approach should include the following facets. First, given the high positive screening rates for mental health problems, programs should focus on regional investment in virtual training of mental health providers in leading assessment practices and evidence-based therapies to treat mental health and substance use disorders. Such therapeutic approaches may include the Collaborative Assessment and Management of Suicide (CAMS) (63), Dialectical Behavior Therapy (DBT) (64), and Cognitive-Behavioral Therapy (CBT) techniques such as Motivational Interviewing and Cognitive Restructuring (65). Given that access to specialty mental health care is limited, particularly for individuals with low incomes, embedding mental health providers in medical settings where COVID-19 diagnostic procedures and heightened stress may be present (e.g., primary care, community health clinics; emergency departments) is critical to reaching those in need of services.

Research also demonstrates efficacy of online alcohol interventions, especially when accompanied by therapeutic principles and person support (66). In light of logistical limitations (e.g., social contact, limited transportation) the pandemic may impose additional impediments on people with lower incomes; therefore, more equitable efforts in the region may promote existing virtual alcohol interventions such as virtual 12-step programs or cognitive-behaviorally based therapies. Selection and implementation of online alcohol interventions should occur in consultation with a qualified substance use expert. Alternatively, mental health service providers may seek to implement online therapy groups for persons with problematic

substance use in the region; such programs can tackle specific problems identified in this needs assessment.

A variety of community-based responses may further address the stress and mental health implications of the pandemic. For instance, community-based screenings are a common practice to detect persons at risk for various mental health and alcohol use disorders (67). We recommend the widespread use of COVID-19 stress and general mental health screening instruments such as those employed in this assessment. They may be implemented in-person or online by partnering with regional agencies, emergency department or primary care facilities, or other non-profit entities. When used online, screening tools should be accompanied by clear instructions on how to reach a provider. Another community-focused strategy is the design of a comprehensive pandemic awareness campaign. Social media, radio, newspaper print, podcast, and other platforms can unify public health messaging such as the importance of remaining socially distanced yet connected, mental health warning signs and benefits of therapy, and free, brief coping skills tools. Additionally, awareness campaign design should employ principles of behavior change theories such as the Theory of Planned Behavior (68). Campaign messages can be augmented by public health educational materials for social media and print distribution *via* non-profit, academic, and healthcare entities in the region.

Our findings also have implications informing public health research moving forward. As COVID-19 becomes endemic, future areas of study will need to identify suitable assessment tools including standardized domains of data collection to monitor the mental health consequences of adjusting to outbreaks and public health interventions to address COVID-19 over time. We utilized two unpublished inventories developed: The Coronavirus Stress Survey (CSS) and Coronavirus Response Scale (CRS). We selected these tools as they are consistent with large-scale research efforts by a leading national healthcare agency, namely the Department of Veterans Affairs. Our findings provide preliminary data suggesting these tools may be useful for future COVID-19 stress and related research. However, other relevant emerging measures exist, such as the COVID-19 Anxiety Scale, (69) that also warrant further study. Mixed-methods findings from our study highlight a number of possible outcomes for COVID-19 stress, coping, and mental health intervention, and program evaluation research. Namely, COVID-19 stress, coping self-efficacy, and a myriad of mental health domains may be the subject of intervention development and evaluation moving forward.

DATA AVAILABILITY STATEMENT

A de-identified dataset is available by direct contact of the corresponding author at rcramer4@uncc.edu.

ETHICS STATEMENT

The current study involved human participants and was reviewed and approved by UNC Charlotte Institutional Review Board. Participants provided informed consent to participate in this study electronically.

AUTHOR CONTRIBUTIONS

AK, RC, CM, AP, MZ, and JL-R: writing. Y-JH, GG, SS, CW, AK, RC, and AM: data collection. RC, AK, and CW: data analysis. Y-JH, RC, AM, and JL-R: getting funding. RC, MZ, and JL-R: supervision. All authors: editing.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.790468/full#supplementary-material

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Suicidal Ideation Is Associated With Excessive Smartphone Use Among Chinese College Students

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Background: Suicidal ideation is the first step and a strong predictor of suicide. College students are at a considerably high risk of suicidal ideation, and smartphones are commonly used in this group. However, the relationship between suicidal ideation and smartphone use among Chinese college students is unclear. The current study aimed to investigate the prevalence of suicidal ideation among Chinese college students and its association with smartphone use and addiction factors.

Methods: A total of 439 college students participated the survey. We collected the demographic information, physical health, psychosocial factors (depressive symptoms, social support, sleep quality), characteristics of smartphone use, and mobile phone addiction (MPA). Suicidal ideation was measured with a single question, "did you feel that life was not worth living in the past 1 year?"

Results: The prevalence of suicidal ideation ("Yes" response) in the past year among Chinese college students was 7.5%. In binary logistic regression analysis, suicidal ideation was significantly correlated with less subjective social support (OR: 2.49, $p = 0.049$), lower utilization of social support (OR: 13.28, $p = 0.012$), more depressive symptoms (OR:4.96, $p = 0.005$), and more than 5 h of daily smartphone use (OR: 2.60, $p = 0.025$).

Conclusion: Considering the widely use of smartphones in Chinese colleges and the correlation with suicidal ideation, excessive phone use among college students should be given more attention by administrators and health workers. It is necessary to obtain more information about the intention of smartphone use, make full use of smartphones for health education, and monitor excessive use of smartphones, while improving social support and coping mechanisms for depression, to identify suicidal ideation and prevent suicidal behavior among Chinese college students.

Keywords: suicidal ideation, smartphone use, mobile phone addiction, college students, social support

INTRODUCTION

Suicide is a significant public health issue worldwide (1). Defined as thinking about, considering, or planning suicide, suicidal ideation is the first step and a strong predictor of suicide (2). College students are at a considerably high risk of suicidal ideation (3–8). Although many previous studies have shown the prevalence of suicidal ideation among college students worldwide, the results vary significantly as the participants reported suicidal ideation for different prevalence periods. For example, the 2-week prevalence of suicidal ideation in Korean college was 9.8% (6), that of the past 4 weeks was reported by 2% among university students (5); 6–12% for the past year (8–11); 12% for 4 years (4); and 11.4–35.3% for lifetime (7, 9, 12). According to a meta-analysis, 10.72% (ranging from 1.24 to 26%) of Chinese college students experience suicidal ideation (13), regardless of the prevalence period. It is necessary to explore the incidence of suicidal ideation among Chinese college students over the past 12 months.

Diverse factors have been reported to be related with suicidal ideation among college students, such as external environment (e.g., living alone, economic class, religious practice, peer problems, suicide attempts in the family or among friends), mental health (e.g., depressive symptoms, sexual orientation, probable obsessive-compulsive disorder, hopelessness, poor social support, maladaptation), and behaviors (e.g., previous suicide attempts, poor academic performance, alcohol consumption, and pathological Internet use) (10, 14–17). Evidence from empirical studies about college students and adolescents has shown that there is a relationship between suicidal ideation and addiction, including substance abuse or dependence (18), alcohol or tobacco consumption (19), pathological Internet use or addiction (15), as well as mobile phone use (20, 21).

Smartphone has been an essential tool in our daily life. It is even applied as an intervention approach to cope with suicidal crises based on its functions (e.g., text messaging, call, Apps) (22–24). However, it should not be ignored that excessive smartphone use or addiction has become a global public health problem, particularly among college students. Previous studies have shown the relationship between suicidal ideation and mobile phone use or dependence in adolescents; for example, both early and late adolescents who use mobile phones past their bedtime may have more suicidal feelings (21). For adolescents with problematic phone use, a good family function is a protective factor for reducing the risk of suicidal ideation (20). Suicidal tendencies may be one of the risky behaviors associated with cellular phone use (19). Research involving Chinese vocational school students found that mobile phone dependence was positively correlated with suicidal ideation, and the risk of suicide was much higher among students with mobile phone dependence and depressive symptoms (25).

To date, most studies exploring suicidal ideation and mobile phone use have focused on adolescents (21). Research on suicidal ideation in college students has focused more on its relationship with Internet use/addiction (26), another critical problem for this group. However, data on phone use are more convenient and readily available than those on Internet use. Remarkably little is known about their relationship between mobile phone addiction (MPA) and suicidal ideation among Chinese college students. Furthermore, the suicidal ideation rate and its association with smartphone use may differ from different cultures (9), and it is meaningful to examine its prevalence and relationship among Chinese college students.

The aim of the current study was to investigate the prevalence of suicidal ideation among Chinese college students and determine its association with smartphone use characteristics and MPA factors.

MATERIALS AND METHODS

Subjects

We conducted a cross-sectional survey in May 2016 at Changsha Health Vocational College. All internal students from the college's Department of Pharmacy were recruited through cluster sampling. We excluded students unwilling to participate in the survey or those with severe physical and mental illnesses.

The study protocol was approved by the Institutional Review Board of the Changsha Health Vocational College. All students agreed to participate in the study and signed informed consent.

Procedures

After signing written consent, all participants were invited to complete the self-report questionnaires in their classrooms. Two professional investigators distributed the questionnaires and instructed the participants to complete them.

Measures

Social-Demographic Characteristics

A detailed self-administered questionnaire was used to collect general information on sociodemographic characteristics, including age, gender, level of family income (poor, fair, and good), and place of origin (rural vs. urban).

Psychosocial Factors

Psychosocial factors include depressive symptoms, social support, and sleep quality. Depressive Symptoms, adapted from the University Personality Inventory (UPI), are measured on the scale of depressive symptoms (SDS) which comprises 12 items, including suicidal thoughts, poor appetite, pessimism, distraction, restlessness, no interest in anything, negative mood, lack of confidence, lack of judgment, feeling self-abased, physically exhausted, frequent insomnia, and hesitation. The score of the item, "having suicidal thoughts" on the UPI, was not included in the total score of the SDS to avoid an overlap between suicidal thoughts due to depressive symptoms and the main outcome of this study. Participants responded "yes" or "no" to each item and given scores or 1 or 0, respectively. The total score ranges from 0 to 12, and higher scores represent more severe depressive symptoms. The Cronbach's α coefficient of SDS in this sample of college students was 0.751 (27).

Two subscales of the validated Chinese Social Support Rating Scale were adopted to assess the utilization of social support and

subjective social support, respectively (28, 29). Higher scores on each subscale indicate higher levels of social support.

Sleep Quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI) (30). The validated Chinese PSQI, with good reliability and validity (31), consists of 18 items. The total score ranged from 0 to 21. Higher scores indicate poorer sleep quality; the cut-off score in China for poor sleep quality is usually ≥ 8 (32).

Physical Health

Physical health included self-reported good health and incidence of headaches (27). Self-reported good health was measured using one question: "During the past year, did you often feel that you were in good physical health?" Respondents with the answer "yes" indicated having good physical health. Incidence of headaches was measured using the question, "During the past year, did you often suffer from headaches?" As before, respondents who selected "yes" were considered to have suffered from headaches.

Smartphone Use and MPA

Smartphone use characteristics included time spent on daily smartphone use and mobile internet use (hours), smartphone charge per month (yuan), length of smartphone use (years), and MPA. In addition, the mobile phone addiction index (MPAI) was used to assess MPA (33). The MPAI consists of 17 items and is scored on a 5-point Likert scale from 1 = never to 5 = always. The MPAI includes four dimensions of MPA: inability to control carving, withdrawal, or escape, feeling anxious and lost, and productivity loss. Higher scores reveal greater severity of MPA.

Suicidal Ideation

Suicidal ideation was measured with a single question: "Did you feel that life was not worth living in the past 1 year?" The response options were yes or no. If the answer was "Yes," the student was considered as experiencing suicidal ideation in the past year. Similar methodology has been followed in previous studies on suicidal ideation (13, 21, 34, 35).

Statistical Analysis

All the statistical analyses were conducted by SPSS software. The prevalence of suicidal ideation was also determined. Differences between participants with and without suicidal ideation in terms of each variable were compared using the chi-square (χ^2) test and Fisher's exact test. All significant factors in the univariate analysis were entered in Binary logistic regression, which was used to recognize factors associated with suicidal ideation. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for each variable. The statistical significance level was set at $p < 0.05$.

RESULTS

After excluding four students who submitted incomplete forms, a total of 439 completed questionnaires were obtained. The average age of the participants was 18.8 years (SD: 1.7, range: 15–24). Generally, there are more females than males in health vocational colleges; thus, 381(86.8%) students in this study were female. The average duration of owning a smartphone was 3.9 years (SD: 2.3). Detailed demographic and psychological factors, characteristics of smartphone use, and MPA are shown in **Table 1**.

A total of 33 students (7.5%) had suicidal ideation ("Yes" response). The chi-square (χ^2) tests (see **Table 1**) showed that students with suicidal ideation were more likely to have less subjective social support ($p < 0.001$), lower utilization of social support ($p < 0.001$), more depressive symptoms (as indicated by a score of three or more) ($p < 0.001$), lack good physical health ($p = 0.027$), and suffer from headaches ($p < 0.001$). Students with suicidal ideation were also found to use a smartphone for more than 5 h a day ($p < 0.001$), and have more serious MPA in terms of inability to control craving ($p = 0.030$).

The binary logistic regression analysis (see **Table 2**) showed that suicidal ideation among college students was significantly associated with less subjective social support (OR:2.49, $p = 0.049$), lower utilization of social support (OR:13.28, $p = 0.012$), more depressive symptoms (OR:4.96, $p = 0.005$), and more than 5 h of daily smartphone use (OR:2.60, $p = 0.025$).

DISCUSSION

The current study investigated the prevalence of suicidal ideation among Chinese college students and its association with smartphone use and MPA. We found a 7.5% prevalence of suicidal ideation, significantly related to less subjective social support, lower utilization of social support, more depressive symptoms, and more than 5 h of daily smartphone use in Chinese college students.

Prevalence of Suicidal Ideation

Our study showed that the prevalence of suicidal ideation among Chinese college students was 7.5%, slightly lower than the overall pooled prevalence of 10.7% from a meta-analysis of 41 studies involving 60,339 Chinese college students (13). The result is quite similar to other research on suicidal ideation among university students in other countries during the same prevalence period (12 months), such as 7.2% among Brazilian medical students (10) and 6% in the USA (11) but lower than the 10.7% in Portugal (8) and 11.3 and 12% in Austria and Turkey (9). The difference in prevalence between countries may be due to the different instruments used to assess suicidal ideation or due to cultural differences (9, 36). The prevalence finding indicates that three in every 40 Chinese college students reported the presence of suicidal ideation in the past year, which should put education administrators on alert.

Suicidal Ideation and Mental, Physical Health

Suicidal ideation was significantly related to socio-psychological factors (depressive symptoms and lack of social support) and poor physical health, consistent with previous studies (14, 20, 37). In the current study, 29 (87.9%) reported depressive symptoms among 33 participants with suicidal ideation. Depression is strongly associated with suicidal ideation among college students, consistent with studies in the USA (38) and Brazil (14, 37). For example, among the 267 Brazilian students who had depressive symptoms, 21.4% had thought of taking their life

TABLE 1 | Socio-demographic and smartphone use characteristics of college students and prevalence rates of suicidal ideation by variables.

Variables		No.	Suicidal ideation (%)		χ^2	*p*
			Yes ($n = 33$)	No ($n = 406$)		
Gender	Male	58	4 (6.9)	54 (93.1)		
	Female	381	29 (7.6)	352 (92.4)	0.037#	0.847
Age	≤19 years	274	25 (9.1)	249 (90.9)		
	≥20 years	165	8 (4.8)	157 (95.2)	2.708	0.100
Place of origin	Rural	246	18 (7.3)	228 (92.7)		
	Urban	193	15 (7.8)	178 (92.2)	0.032	0.858
Self-rated family economic status	Good	26	1 (3.8)	25 (96.2)		
	Fair	256	17 (6.6)	239 (93.4)		
	Poor	157	15 (9.6)	142 (90.4)	1.724#	0.422
Subjective social support*	≤9	227	26 (11.5)	201 (88.5)		
	>9	212	7 (3.3)	205 (96.7)	10.479	0.001
Utilization of social support*	≤8	288	32 (11.1)	256 (88.9)		
	>8	151	1 (0.7)	150 (99.3)	15.557	<0.001
Depressive symptoms*	≤2	210	4 (1.9)	206 (98.1)		
	>2	229	29 (12.7)	200 (87.3)	18.24	<0.001
Good physical health	Yes	381	24 (6.3)	357 (93.7)		
	No	58	9 (15.5)	49 (84.5)	6.153#	0.027
Headache	Yes	92	15 (16.3)	77 (83.7)		
	No	347	18 (5.2)	329 (94.8)	12.928	<0.001
Characteristics of phone use						
Years of smartphone use*	≤4	267	24 (9.0)	243 (91)		
	>4	172	9 (5.2)	163 (94.8)	2.123	0.145
Monthly smartphone charge (RMB) *	≤50	236	17 (7.2)	219 (92.8)		
	>50	203	16 (7.9)	187 (92.1)	0.072	0.788
Hours of daily smartphone use*	≤5	249	10 (4.0)	239 (96)		
	>5	190	23 (12.1)	167 (87.9)	10.144	0.001
Hours of mobile internet use*	≤5	260	15 (5.8)	245 (94.2)		
	>5	179	18 (10.1)	161 (89.9)	2.802	0.094
Mobile phone addiction index						
Inability to control carving*	≤14	239	12 (5.0)	227 (95)		
	>14	200	21 (10.5)	179 (89.5)	4.702	0.030
Feeling anxious and lost*	≤7	258	18 (7.0)	240 (93)		
	>7	181	15 (8.3)	166 (91.7)	0.263	0.608
Withdrawal or escape*	≤7	259	18 (6.9)	241 (93.1)		
	>7	180	15 (8.3)	165 (91.7)	0.292	0.589
Productivity loss*	≤5	231	13 (5.6)	218 (94.4)		
	>5	208	20 (9.6)	188 (90.4)	2.503	0.114
Poor sleep quality	Yes	43	6 (14.0)	37 (86)		
	No	396	27 (6.8)	369 (93.2)	2.841#	0.119

**All continuous variables were dichotomized at the median value.*
#Fisher's exact test.

in the previous 30 days. People suffering from depression may have negative thoughts about life, leading to suicidal ideation and even suicide attempts. On the contrary, the continuous presence of suicidal ideation may increase the severity of depressive symptoms. In the binary logistic regression analysis, a strong association between suicidal ideation and depressive symptoms remained.

Social support was also strongly related to suicidal ideation among college students, similar to previous studies (13). College students with less subjective social support and lower utilization of social support may experience higher levels of suicidal ideation given that social support is an important protective factor against suicidal ideation. Conversely, high levels of family cohesion and family support were significantly correlated with lower levels

TABLE 2 | Binary logistic regression of factors associated with suicidal ideation.

Variable	Risk level	Reference level	Unstandardized coefficient	Standard error	Wald χ^2	*p*	OR (95%CI)
Subjective social support*	≤9	>9	0.910	0.462	3.881	0.049	2.49 (1.01, 6.15)
Utilization of social support*	≤8	>8	2.587	1.033	6.273	0.012	13.28 (1.76, 100.55)
Depressive symptoms*	>3	≤3	1.602	0.568	7.940	0.005	4.96 (1.63, 15.12)
Hours of daily smartphone use*	>5	≤5	0.956	0.427	5.009	0.025	2.60 (1.13, 6.01)

**All continuous variables were dichotomized at the median value.*

of suicidal ideation (39). For college students, support mainly comes from family, friends, and school. Therefore, it is essential to evaluate the support system, improve subjective social support, and make full use of it.

In this study, we found a positive correlation between suicidal ideation and poor physical health. College students who thought they did not have good physical health or had headaches in the past year may be at greater risk of suicidal ideation. Several studies have confirmed that individuals suffering from diseases or pain may be more likely to end their lives (17). Low physical activity was related with suicidal ideation among Chinese college students (40). College students should take enough physical training and keep physical health. Meanwhile, teachers should pay more attention to those students with poor physical health.

Suicidal Ideation and Smartphone Use and MPA

The current study revealed that students with suicidal ideation were more likely to use phones for more than 5 h a day and have more serious MPA in terms of inability to control craving. The binary logistic regression analysis found that only the relationship between suicidal ideation and excessive smartphone use is significant. This finding is consistent with prior studies on adolescents. Oshima et al. (21) found that suicidal feelings were significantly correlated with nocturnal mobile phone use among Japanese adolescents. A 1-year-follow-up study among Chinese adolescents revealed that excessive use of mobile phone was an important risk factor of self-harm (41), which is also an early predictor of suicidal behaviors like suicidal ideation. However, inconsistent with other studies, we did not find a strong relationship between suicidal ideation and MPA. A previous study highlighted the connection between problematic cellular phone use and suicidal ideation among Chinese adolescents (20), in which problematic cellular phone use included the symptoms and participants' subjective functional impairment in the preceding year. The reasons for the inconsistent results may be due to the different tools of measurements used. Furthermore, when assessing the contribution to suicidal ideation among college students simultaneously, excessive smartphone use contributes more than MPA. Further studies are required to examine these relationships.

However, the exact mechanism underlying the relationship between suicidal ideation and smartphone use remains unknown. Smartphone use can either have a devastating effect, or a protective effect on those with suicidal ideation. On one hand, excessive smartphone use may affect suicidal ideation through psychological pathways, such as depression, poor sleep quality, chaotic lifestyle, low self-esteem, and low-income family function (20). For example, studies suggested family function moderately affected the association between problematic phone use and suicidal ideation and good family function may help to decrease the risks of suicidal ideation (20). Depression and interpersonal problems mediated the association between high-intensity phone use and suicide ideation (42). On the other hand, when students intend to harm themselves or even end their lives, they may benefit from using mobile phones (19). In some studies on Internet addiction (43), smartphone use is viewed either as a threat or an opportunity. Our study agrees that college students with suicidal ideation may use mobile phones more frequently, but not have MPA. However, individuals' frequent smartphone use may be due to two factors: getting helps through interventions (e.g., "online counseling," support group, self-evaluation), and getting information about suicide (using the phone as a medium to learn methods to end their lives) (22, 44). Smartphone use may be a cope style for those individuals with suicidal thoughts. Therefore, further studies are needed to explore the actual reasons for the association between smartphone use and suicidal ideation.

The following limitations of this study need to be acknowledged. First, this was a cross-sectional study; thus, the causal relationship could not be clarified when significant associations with excessive smartphone use, depressive symptoms, and social support were observed. Therefore, longitudinal follow-up studies are essential. Second, we used a self-report questionnaire, which can result in a recall bias. Third, our sample was recruited from a health vocational college, which limits the representativeness of the sample. Therefore, caution is necessary when generalizing the findings to other samples. More large-scale and prospective studies with well representative should be conduct to confirm these associations.

CONCLUSIONS

In summary, approximately three out of 40 Chinese college students experienced significant suicidal ideation in the past year, and suicidal ideation was significantly associated with poor social support, depression, and excessive smartphone use. Considering the widely use of smartphones in Chinese colleges and its relationship with suicidal ideation, administrators and health workers ought to give greater attention and concern to the excessive phone use among college students. Therefore, it is necessary to obtain more information about the intention

of smartphone use, make full use of smartphones for health education and monitor excessive use of smartphones, while improving social support and coping mechanisms for depression, to help identify suicidal ideation and prevent suicidal behavior among Chinese college students.

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

The studies involving human participants were reviewed and approved by the Institutional Review Board of the Changsha Health Vocational College. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

QH, SL, JQ, and HS conceived and designed the study. YinL, SH, ZL, XC, TS, and YifL collected and analyzed the data. QH and SL wrote the manuscript. YC, JQ, and HS revised the manuscript. All authors approved the final manuscript to be published.

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The Use of Helplines and Telehealth Support in Aotearoa/New Zealand During COVID-19 Pandemic Control Measures: A Mixed-Methods Study

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Background: Early evidence suggests that the COVID-19 pandemic and associated interventions have affected mental well-being and associated health service use.

Aims: the aim of this study was to examine the effect of the COVID-19 pandemic and associated public health measures on helpline and telehealth service demand.

Methods: the study utilized a mixed methods research design. Segmented regression analyses were used first to identify changes in patterns of demand for Aotearoa/New Zealand national helplines ($n = 11$) from January 2020 until the end of March 2021. Thematic analysis of 23 in-depth interviews was used next to explore the reasons behind the quantitative findings from the perspective of various organizational stakeholders.

Results: the data from 1,244,293 Aotearoa/New Zealand national helplines' contacts between January 2020 and March 2021 showed a non-significant (1.4%) upward trend for the full range of observations. Throughout this period, a peak and trough pattern was observed. Significant demand increases were observed in anticipation of containment measures (12.4% increase from January to March 2020) and significant demand decreases coincided with relaxation of restrictions (6.9% decrease from April to June 2020). There were spikes in demand during public health interventions (i.e., mental health promotion, introduction of new helpline services) and regional lockdowns, but these did not result in significant changes in trends. In general, the demand for helplines stabilized at a new higher level. Most of the contacts occurred by telephone calls. Contacts by other methods (webchat, text, email) have shown higher uptake during the periods of lockdowns. Quantitative-qualitative data triangulation showed that youth and populations who were disproportionally negatively affected by unstable economic conditions and underemployment made more frequent contacts. Providers emphasized that increased demand could be viewed positively as a successful outcome of public health messaging; however, greater capacity is needed to better serve higher demand.

Conclusions: COVID-19, related interventions, and measures of control were associated with an increase in contacts to helplines. However, the extent of the demand increases was lower than observed internationally. Moreover, in Aotearoa/New Zealand the reasons for increases in demand were often beyond the COVID-19 pandemic and measures of control.

Keywords: telehealth, helplines, public health campaigns, pandemics, COVID-19, health services use, disease control

INTRODUCTION

COVID-19 was declared a global pandemic by the World Health Organization (WHO) on March 11, 2020. To prevent transmission of the disease, many governments issued directives for people to stay at home, limiting travel and many work, recreational and economic activities. These measures have had a significant impact on daily life, even in Aotearoa/New Zealand which adopted a "go hard, go early" elimination strategy (see **Appendices 1–3**) (1). Whilst this strategy resulted in low COVID-19 infection rates and relatively few COVID-19 deaths, with New Zealanders overall experiencing much lower levels of COVID-19 bereavement and due to low infection rates, relatively fewer cases of long COVID-19 (2) when compared with most other countries (3, 4), the COVID-19 pandemic has not been without its impacts.

There was a great deal of concern that pandemic control measures would have a negative impact on mental health at a population level. Early international self-report surveys suggested increased psychological distress in the community, although there was considerable variation in the study findings and many studies had methodological shortcomings [for review see (5)]. A longitudinal study in the United Kingdom (UK) (6) found increased rates of suicidal ideation between March and May 2020, although there was no change in levels of depression or loneliness, decreased anxiety and increased well-being across the study period. An early New Zealand study of 681 respondents suggested levels of depression and anxiety exceeded pre-COVID-19 norms (7), albeit with a comparison that was based on international population data (8–10). At the same time, anxiety levels were lower amongst female participants in New Zealand compared with the UK, even though nearly half of New Zealand participants were key/essential workers, a group experiencing highly anxiety provoking situations in their work at that time (7). Another study conducted in April 2020 with 2,010 respondents suggested that nearly one third of respondents were experiencing moderate to severe distress, although nearly two thirds had experienced some "silver lining" effect of the lockdown experience (11).

Larger New Zealand community-based studies such as the New Zealand Health Survey (NZHS) suggested a small increase in prevalence of psychological distress at a population level, rising from 7.4% in 2019/20 ($n = 12{,}989$) to 9.3% in 2020/21 ($n \sim 13{,}000$) (12). A New Zealand Health Promotion Agency funded survey in April and June 2020 noted that 10% of the 1,190 respondents reported severe anxiety or depression. In contrast, nine out of 10 people reported at least one positive experience during the lockdown, particularly Māori and Pacific respondents (13). These studies also suggested that not all members of the community were equally affected by psychological distress in the early stages of the pandemic: with higher self-reported psychological distress for females; those more vulnerable to COVID-19; those in lower socio-economic groups and those unemployed or living with young children (5, 6, 14). For New Zealand specifically, younger age (11, 13) and being at higher risk of contracting COVID-19 were important factors (7).

Two of several population-level interventions are worth considering when examining the psychosocial impact of COVID-19. First, the entire population of New Zealand were subject to strong pandemic control measures and a hard lockdown commenced in March 2020. Specifically, measures included highly restricted international and national borders, strict quaranteen measures requiring New Zealanders to stay at home except for essential purposes such as grocery shopping, acute hospital care and restricted outdoor exercise and essentail work (i.e., food supply chains and health care). All social gatherings were suspended. Social contact was limited to those within households (see **Appendices 2, 3**). These restrictions presented a significant set of challenges. A review by Brooks et al. (15) has suggested that infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss, and stigma are associated with increased psychological difficulties in these circumstances.

The second population level intervention to consider was an extensive psychosocial and mental well-being plan *Kia Kaha, Kia Māia, Kia Ora Aotearoa: COVID-19 Psychosocial and Mental Wellbeing Plan* (16). This plan outlined a range of policy and service level activities to support population mental health during the pandemic period. It was first published in May 2020, with further revision in December 2020. Mulitmedia campaigns (e.g., "Getting Through Together," "Struggle Got Real?") were rolled out to normalize psychological distress in uncertain COVID-19 times. This campaign also actively promoted an array of services, including telehealth services (17, 18). Telehealth services are defined as the delivery of health care, health education, and health information services via remote technologies (19). This approach is particularly relevant to the COVID-19 period, as pandemic control measures decreased access to face-to-face, or in-person support options (20, 21).

International reports suggest that in the early COVID-19 pandemic period, helpline and telehealth service demand increased particularly following lockdowns or spikes in infection

rates (22–26), often followed by decreased demand (22–24, 26). During the first months of the pandemic (January to April 2020), some countries experienced much higher increases in demand [44% in Romania (23), 50% in the United States (25)] than others [∼8% in Australia for Kids Helpline (22)]. Decreased demand was observed when COVID-19 cases stabilized and pandemic control measures relaxed, but also ranged ∼3% reduction in demand for Kids helpline in Australia (22) to 24% reduction in demand for a general national mental health helpline in Romania (23). More modest fluctuations were seen during the second wave of COVID-19 infections (26). Internet searches for telehealth services worldwide also spiked in March 2020, but tailed off, albeit at a higher level, thereafter (27). In contrast to telehealth demand, face-to-face presentations to healthcare services fell (25, 28). Media reports in Aotearoa/New Zealand suggested a sharp increase in calls and texts to mental health helplines following the first national lockdown, particularly by people seeking help for the first time (29). However, robust studies quantifying the extent of changes in demand associated with COVID-19 and associated control measures are scarce (22, 25) and few have longer term data collection periods.

Within the methodological constraints outlined above, these studies suggest that nearly two-thirds of contacts to helplines at the start of the pandemic were coming from females (25, 26), although lower proportion of female callers were found in a study from India (13% females) (24) and higher proportions of females in the elderly (30) and younger populations (22) (85% and ∼75% respectively). In an Australian study of younger people, the increase in demand was also higher for females (5% monthly increase from January to August 2020) than for males (4% monthly increase from September 2019 to August 2020). This is also one of the few studies that document gender-diverse populations with a continuous trend of 1% monthly increase in demand from gender-diverse Australian youth between 2017 and the COVID-19 pandemic (22) period. In the United States, there was a significant increase of 5% in telehealth contacts for those aged 18–49 years from January to March 2020 (25). In Australia, contacts from children aged 5–12 increased of 9.9% per month from February until August 2020; teens aged 13–17 years had a 3.5% monthly increase in contacts (22). Younger people appeared to have shifted mode of contact, with webchat being used increasingly during COVID-19 control measures (22).

With regards to difficulties faced by people who contacted helplines, although in the early stages of the pandemic (January to February 2020) most telehealth contacts had non-COVID-19 related queries, the proportion of COVID-19–related encounters grew over time (25). Anxieties related to quarantine measures (including loneliness), COVID-19 illness fears, worries about the economy, and concern about health of loved ones emerged as the most prominent concerns (26, 31). Contacts from people seeking help about family relationships also increased, especially during spikes in infection rates and associated control measures (22). Studies have also shown increased rates of people contacting helplines with symptoms of anxiety and depression (26, 30, 31), and an increase in crisis calls in younger populations was observed in Australia (22). Again, with an exception of two studies (22, 25), these observations should be interpreted with caution due to methodological limitations.

This current study examined patterns of contact with national telehealth services in New Zealand prior to and during the COVID-19 pandemic (January 2020 until the end of March 2021) in Aoteaora/New Zealand. Telehealth services were defined as helpline services or telehealth technology that is used in the primary care/General Practice context.

The aims of this study were to:

1. Identify changes in patterns of demand for national telehealth services before and during the COVID-19 pandemic period, with variations described in terms of gender, ethnicity, age, mode of contact and reasons for contact in a methodologically robust way;
2. Explore the reasons behind observed patterns of change from the perspectives of service providers, and the implications for future practice.

MATERIALS AND METHODS

We employed a mixed methods approach; a quantitative interrupted time series analysis examining summary statistics of de-identified helpline service users' data and a qualitative thematic analysis of interviews with helpline managers and staff, General Practitioners, and other healthcare service providers to understand the impact of COVID-19 containment measures on patterns of service usage. For the qualitative aspects of the study, we followed Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines (32). For the quantitative aspects of the study, we followed The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (33). The study was approved by the University of Auckland Health Research Ethics Committee (AH3109).

Participant Selection and Sampling of Organizations

Between 1 November 2020 and 30 April 2021 we purposefully sampled (by funding type, size, areas of expertise, target population age, gender, ethnicity), and approached 23 (of ∼33 that exist) national helplines and support organizations (henceforth commonly referred to as helplines) and 13 General Practices across Aotearoa/New Zealand (selected by area and practice size).

Fourteen national helplines, and three General Practices agreed to participate in the qualitative interviews (see **Figure 1**). The final sample included national helplines representing those with public and private funding, a range of sizes (8–350+ staff/volunteers), different areas of expertise (general health, general support, general mental health, specialized services targeting presentations of anxiety, depression, substance use, eating disorders, suicide and self-harm support etc.), and various target populations such as age (general, services for youth, services for elderly), gender and sexuality (general, specific to male, specific to female, LGBTQI+), ethnicity (general, Māori, Pacific Peoples, Asian populations, people with refugee status). Some of the organizations were umbrella organizations

representing multiple services. Two of the General Practices were Auckland based (Central and South Auckland) and one Christchurch based. We also included interviews with other healthcare service providers to gain insight into the contextual issues from a broader perspective.

We used a combination of snowball sampling, and cold calling to identify potential participants. Two-fifths of final participants were recruited by cold calling, with remaining three-fifths being recruited by snowball sampling. Four of the helplines and two General Practices declined to participate, and five helplines and nine General Practices never replied. Reasons for not participating were often not explained, but organizations that did participate described difficulties in finding time for the research participation due to increase service demands.

Eleven helplines agreed to provide de-identified service usage data for the quantitative component of the study. Fifty-five percent of the data provided were represented by government funded organizations and the rest by non-governmental organizations (NGOs). The data were shared by organizations of various sizes and areas of expertise.

Procedures

The Chief Executive Officers (CEOs) of organizations were approached for consent to interview key informants and to provide de-identified service user data. Once consent was obtained, we then approached potential key informants, explaining the methodology and study aims. The key informants had to provide additional consent. In the case of non-response, we followed up with the organization once every 2 weeks to a maximum of four times. Most participants preferred for their interviews to take place on Zoom (conducted in private settings where the interview could not be overheard). Two interviews were face-to-face, two participants replied in writing. In addition, one organization shared qualitative data available from their own internal review.

We used a semi-structured interview guide (see **Appendix 4**) to elicit open-ended responses relevant to our research question (34). The interviewer did not previously know the participants with one exception. Interviews were audio-recorded and transcribed by a professional transcriber under a confidentiality agreement. Transcripts were de-identified by the interviewer. The audio recordings and identifiable parts of interview transcriptions were permanently deleted.

The quantitative helpline data were provided in free format and were of variable quality. Slightly more than a half of helplines provided the data in a timeseries format (cumulative weekly or monthly data). The remaining helplines provided daily de-identified service usage data that were then combined by the research team into weekly and monthly timeseries for the purpose of interrupted timeseries analyses. Nine of the helplines have been in operation during the entire study period (January 2020 to March 2021). Two of the helplines were established during the study period; one began operations in March 2020 (Week 10) and the other in May 2020, however, the data collection pertaining to the latter helpline only began in June 2020 (Week 24).

All but one organization provided mutually exclusive ethnicity and gender categories. Where multiple ethnicity data was provided, the New Zealand Ministry of Health ethnicity data protocol was used to allocate those with multiple ethnicities to one for the purposes of analyses (35). In instances where male and female genders were reported simultaneously and when people explicitly identified as transgender, a gender-diverse category was used.

Research Team and Reflexivity

The research team consisted of eight academic researchers (including lived-experience researchers) of diverse ethnicity, currently residing in Aotearoa/New Zealand and Australia. Some researchers were trained clinicians and many held additional clinical, suicide prevention, or other advisory roles. All members of the research team identified as female. The project was funded by the Oakley Mental Health Foundation.

Analysis

Quantitative Service Use Data

Segmented regression analyses were used to identify time points where a statistically significant change in trend occurred prior and during the COVID-19 pandemic in Aotearoa/New Zealand (from January 2020 until the end of March 2021). The trends for full range of observations were also considered to gain a better understanding of the overall impact independent of fluctuations. These analyses provide an estimate of the average percentage change (APC), with associated 95% confidence intervals (CIs). Although we report whether the results are statistically significant, these do not represent absolute threshold values and should not take priority in the interpretation of this work (36). Models used Poisson standard errors and the Bayesian Information Criterion (BIC) was used to guide model selection. Analyses were implemented using the Joinpoint Regression Program version 4.8.0.1 (37).

Dependent variables were: the total number of contacts, contacts per modality (e.g., telephone, text, email, webchat), contacts by repeated/unique callers (unique, repeated), contacts across gender/sex (male, female, gender diverse), age group (under 25 years old, 25–64 years old, and 65+ years old), and ethnic grouping [New Zealand European/Pākehā, Māori, Pacific Peoples, Asian, Middle East, Latin American, and African (MELAA), and "Other" ethnicities]. Weekly timeseries data were available and analyzed based on average weekly percentage change (AWPC) for the total number of contacts, contacts per type, and repeated/unique callers. Monthly timeseries data were available and analyzed based on average monthly percentage change (AMPC) for demographic data (gender/sex, age, ethnicity). All of the analyses included all of the eleven helplines, unless specified otherwise. We decided to include data from the two new helplines in our main analyses, assuming high probability of redistribution of the demand.

Missing data represented 3% of total monthly and weekly timeseries and were derived by product of weighted percentage change per period by the available count from the prior or following period, whichever was applicable.

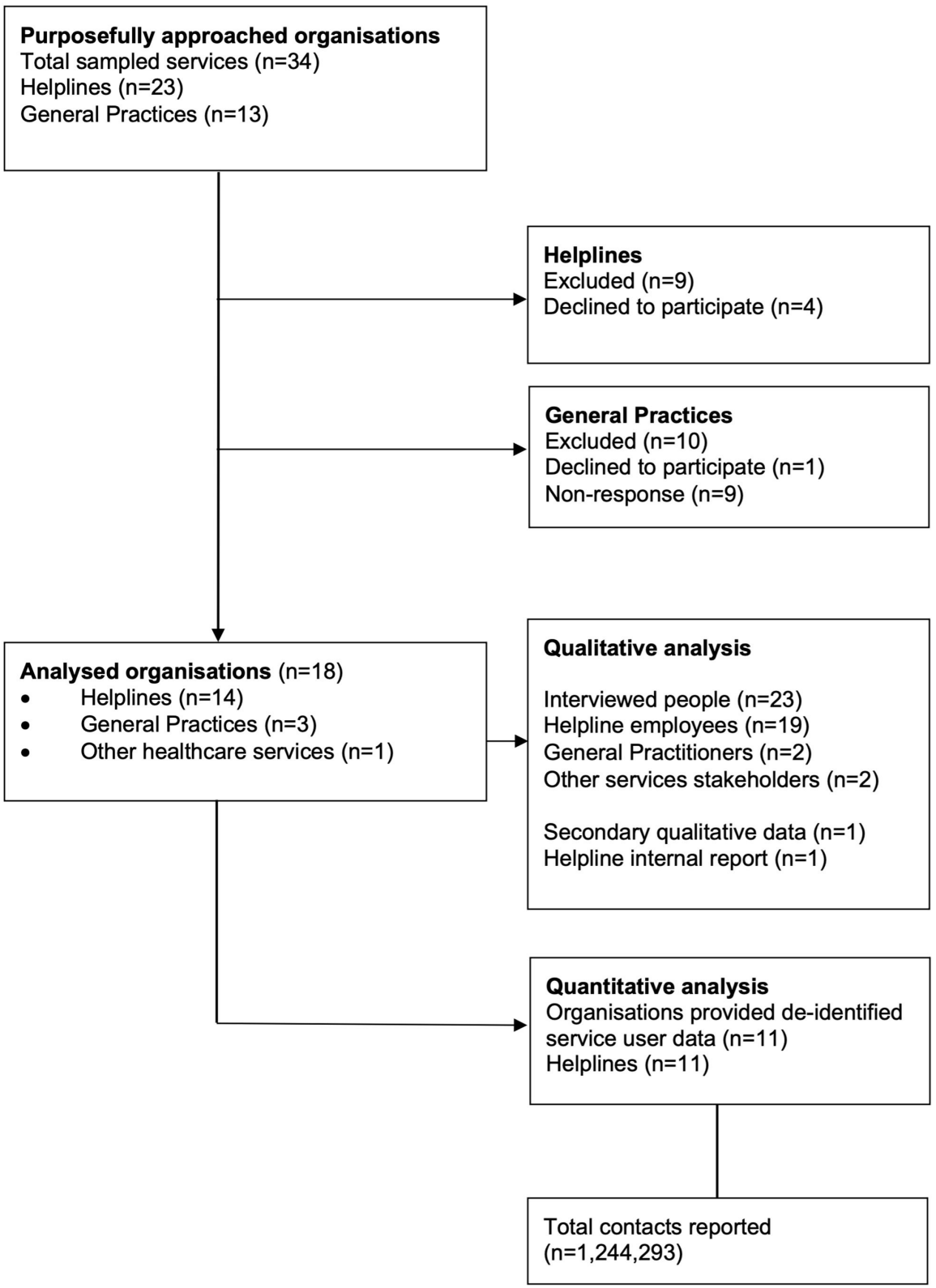

FIGURE 1 | Data collection flow diagram.

Qualitative Interview Data

In this study, we used an inductive thematic approach (38) that was data driven and atheoretical. We used a general inductive approach (39), which aimed to synthesize data under the research questions, building both from a data up approach, as well as using a top down where we were examining data on the basis of the pre-established research questions. Two researchers conducted independent coding and two other members of the team looked at the data to minimize the risk of idiosyncratic interpretation before themes were discussed with the wider research group. We kept written memos with reflections on how personal beliefs and values could affect interpretation of the data, keeping in mind our duty to contribute to the improvement of national helpline services and telehealth as used in the context of primary care.

Both quantitative and qualitative results were analyzed in the context of Aotearoa/New Zealand COVID-19 pandemic related events (**Appendix 1**) and general (**Appendix 2**) and healthcare (**Appendices 3A,B**) restrictions associated with the official Alert Levels.

RESULTS

Sample Characteristics

Quantitative Data

Between January 2020 and March 2021, participating helplines received a total of 1,244,293 contacts. Of these, nearly three quarters were unique, and a quarter were repeated callers. The majority of these were telephone calls, followed by text, webchat, email, and other methods (e.g., website, Facebook, other unspecified methods). Notably, for 40% of helplines telephone contact was the only service provision option. Of unique contacts, 90% have reported gender, 83% have reported age, and 75% have reported ethnicity (see **Table 1**). Younger people were less likely to have ethnicity and gender data available for their contacts.

The majority of people who contacted services were female (62%), followed by male (38%), and a smaller number were gender-diverse (<1%). In terms of age, the majority were 25–64 years old (53%), followed by people under 25 years old (39%), and people aged 65 or older (8%). In terms of ethnicity, the majority identified as New Zealand European/Pākehā (63%), followed by Māori (17%), assigned "Other" ethnicity (9%), identified as Asian (6%), Pacific Peoples (5%), and MELAA (<1%).

Qualitative Data

Between September 2020 and March 2021, we interviewed 23 employees/volunteers from 14 national helplines, health related services and 3 General Practices. Study participants mostly held managerial positions, but also included 35% of staff that also were in direct contact with service users. Participants were a mix of paid staff and volunteers (**Table 2**).

TABLE 1 | Sample characteristics helpline contacts January 2020 to March 2021 ($N = 1,244,293$).

Characteristic		Count
Gender	Male	304,575
	Female	494,664
	Gender-diverse	1,012
	Not reported	10%
Age	<25	293,854
	25–64	402,934
	65+	60,430
	Not reported	17%
Ethnicity	NZ European/Pākehā	416,525
	Māori	110,103
	Pacific Peoples	35,806
	Asian	40,647
	MELAA	5,014
	Other	56,802
	Not reported	25%
Contact type	Telephone	948,763
	Text	253,500
	Email	12,227
	Webchat	12,650
	Other	189
Contact status	Repeated	306,465
	Unique or new	934,580
	Unknown	6,222

TABLE 2 | Qualitative participants characteristics ($N = 23$).

Characteristic		Count
Gender	Male	7
	Female	16
Age	25–64	22
	65+	1
Ethnicity*	NZ European/Pākehā	15
	Māori	2
	Pacific Peoples	2
	Asian	3
	Other	1
Seniority*	Managerial role	18
	Non-managerial role	8

Not mutually exclusive.

Changes in Patterns of Demand Across the COVID-19 Pandemic Control Period Covering January 2020 to March 2021

General Patterns of Demand

All of the eleven helplines provided the total number of contacts per week. The timeseries analyses showed evidence of a non-significant 1.4% upward trend in contacts for the full range of

observations over the full time period [95% CI −1.1 to 4.0, $t_{(63)} = 1.1, p > 0.05$].

A significant increase of 12.4% in contacts was seen between weeks 1 and 12 in 2020 (January to March 2020) when COVID-19 pandemic control measures began in Aotearoa (95% CI 8.4–16.4, $p < 0.001$). This increase was followed by a significant decrease of 6.9% from week 12 until week 22 (April to June 2020) that coincided with movement from Alert Level 4 (the most restrictive level) to Alert Level 2 (few COVID-related restrictions) (95% CI −10.7 to −2.9, $p < 0.001$) and then a non-significant rebound of 18.5% until week 25, which was associated with an introduction of a new helpline and related publicity (95% CI −28.0 to 94.9, $p = 0.497$), followed by a more gradual but significant decrease of 0.5% in total contacts (95% CI −1.0 to 0.1, $p < 0.05$; **Figure 2**).

Other spikes in contacts that can be seen graphically (**Figure 2**) rather than statistically, coincided with regional lockdowns, where Auckland (New Zealand's largest city) was partially or fully shutdown: Level 3 lockdown in August 2020 (weeks 33–35), partial shutdown of the Auckland Central Business District (CBD) (12th November, 2020, week 46), and in February 2021 with an Auckland regional Level 3 lockdown (weeks 6–10).

Participants who took part in the qualitative interviews suggested that both the COVID-19 pandemic and the associated control measures led to increased service contacts. This increased demand was interpreted as positive by some, that is normalizing contacting services for mental health support, and more cautiously by others who described it as a possible indication of elevated levels of societal distress. Participants noted that increases in demand due to lockdowns usually stabilized, with demand returning to normal levels once the lockdown measures were lifted. The greatest spike in demand was seen during the first lockdown, and less so in subsequent lockdowns.

> "*In the more recent lockdowns just at level three, it hasn't been quite as profound anymore. It's been a bit more business as usual even with the lockdowns.*" (Participant 8).

Helplines, relevant healthcare organizations, and primary care providers all commented on the impact of COVID-19 pandemic on face-to-face contacts. General Practices were "*. . . worried that [...] women that are due for their cervical smears, babies that were due for their immunisations, would be delayed*" (Participant 3). Members of the community were also thought to be "*avoiding hospitals and emergency departments*" (Participant 16). "*The sum total of the result of all of this - [as] secondary care, face-to-face services, were much more difficult to access or inaccessible - was that everybody turned to the telehealth services. So helplines' numbers just went through the roof*" (Participant 16).

Participants felt that some healthcare was likely deferred until lockdown measures were lifted, rather than switched to accessing telehealth care in the context of primary care:

> "*. . . I mean, how do you get an anxious little girl to sit in front of the camera and talk to you?*" (Participant 3)

New and Repeated Contacts

All helplines provided data regarding repeated contacts, 10 helplines provided data regarding unique or new contacts, and three helplines indicated that the repeat vs. new contact status was unknown. The total number of contacts analyses by repetition status equals 1,220,886.

For the full observation period, there was a non-significant upward trend of 1.3% of unique contacts [95% CI −1.7 to 4.4, $t_{(63)} = 0.9$, $p > 0.05$], while the number of repeated contacts remained stable [AWPC 0.0 95% CI −1.1 to 1.1, $t_{(63)} = 0.0$, $p > 0.05$]. The number of contacts where repetition was unknown showed a significant downward trend of 5.3% [95% CI −8.1 to −2.5, $t_{(63)} = -3.6$, $p > 0.05$].

The **Figure 3** below show a significant 11.1% increase in unique (new) contacts until week 12 (January to March 2020) (95% CI 6.6–15.8, $p < 0.001$) which was followed by a significant 7.6% decrease until week 22 at the end of May 2020 (95% CI −12.1 to −2.8, $p < 0.01$), then a non-significant increase of 23.6% until week 25, or just after the lifting of the lockdown (8th of June, 2020) and when a new helpline was introduced (95% CI −32.1 to 124.9, $p = 0.481$), with a further 0.5% non-significant decrease following this (95% CI −1.0 to 0.0, $p = 0.071$).

There is also evidence of a significant 3.4% increase in contacts from repeated users until week 15 (April 2020)—leading up to and during the first Alert Level 4 lockdown (95% CI 2.1–4.7, $p < 0.001$), followed by a significant 0.5% decrease thereafter (95% CI −0.7 to −0.3, $p < 0.001$).

Interview participants also described an increase in new contacts, mainly attributed to the public health promotion campaign that normalized psychological distress in the context of the pandemic.

> "*There's information out there, I think it did an amazing job of in a way normalising that people do get anxious and it's okay to reach out. So we did get some people who called us for the first time . . . .*" (Participant 13).

Participants also described experiencing more contact from family members, flatmates, and organizations asking about how to support their whānau (family) rather than the more typical pattern of people seeking support for themselves.

Contact type

Trends of contacts by contact type are provided in **Figure 4**. The following analyses include all telephone, text, webchat, and email contacts ($N = 1{,}227{,}140$). Not all services provided website, or Facebook channels consistently throughout the observation period, so these were excluded from subsequent analyses ($N = 186$). All of the eleven helplines provided a breakdown of contacts per contact type per week. All of the helplines had a telephone option of contact, six had an option of contact by text or webchat, and five by email. Three of the helplines could be contacted by phone only.

For the full range of observations, the timeseries analyses showed evidence of a significant upward trend of 0.8% in contacts by text [95% CI 0.1–1.5, $t_{(63)} = 2.3$, $p > 0.05$], and non-significant upward trend of 1.3% via telephone method of contact

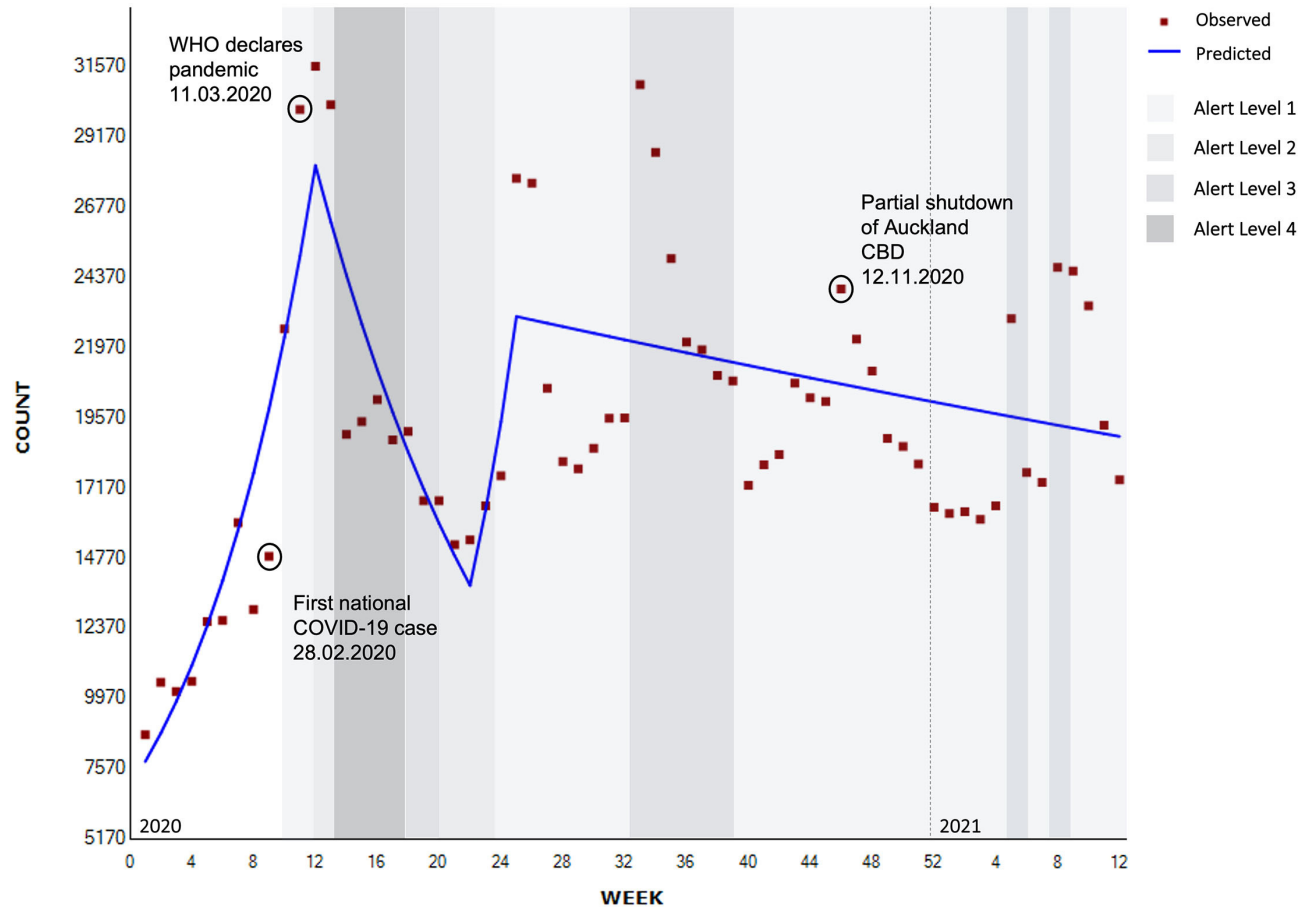

FIGURE 2 | Segmented regression analysis of total contacts to national helplines (weekly) (N = 1,244,293).

[95% CI −1.7 to 4.4, $t_{(63)} = 0.9$, $p > 0.05$] and of 0.5% by webchat method of contact [95% CI −1.2 to 2.2, $t_{(63)} = 0.5$, $p > 0.05$]. Email contacts saw a non-significant downward trend of 0.4% for the full range of observations [95% CI −2.1 to 1.4, $t_{(63)} = -0.4$, $p > 0.05$).

There is evidence of a significant 10.8% increase in telephone contacts between 2020 week 1 and week 12 (January to March 2020), in the period leading up to the lockdown measures (95% CI 6.3–15.5, $p < 0.001$), followed by a significant decrease of 7.4% during the first lockdown until week 22 at the end of May 2020 (95% CI −12.0 to −2.6, $p < 0.01$), followed by a non-significant 24.5% increase after the lifting of the lockdown to the Alert Level 1 (Week 25–8th of June, 2020) that also coincided with an introduction of an additional national helpline (95% CI −31.3 to 125.6, $p = 0.494$). This increase was followed by a more gradual non-significant decrease of 0.5% after this time (95% CI −1.0 to 0.0, $p = 0.069$).

There is evidence of a significant increase of 13.6% in text contacts from February up until week 15, or early April 2020 coinciding with the beginning of the first lockdown under Alert Level 4 (95% CI 10.9–6.3, p <0.001). It was followed by a significant decrease of 7.1% until week 21 or until the easing of the lockdown to the Alert Level 2 in May 2020 (95% CI −10.3 to −3.8, $p < 0.001$), and a moderate significant decline of 1.3% from August until the end of the year (95% CI −1.7 to −0.8, $p < 0.001$) followed by a moderate significant increase of 1.5% in the beginning of 2021 (95% CI 0.3–2.8, $p < 0.05$).

There is evidence of a non-significant increase of 1.8% in email contacts between week 1 and week 13 2020 (January to March 2020) (95% CI −0.3 to 4.0, $p = 0.088$) and non-significant increase of 25.9% between weeks 13 and 16 at the start of the Alert Level 4 lockdown (95% CI −3.3 to 63.9, $p = 0.086$), followed by non-significant 6.2% decrease until week 21 2020 easing into Alert Level 2 lockdown (95% CI −13.5 to 1.7, $p = 0.118$). These fluctuations in contacts by email were followed by a moderate significant increase of 1.6% in contacts by email until week 50 2020 or mid-December (95% CI 1.2–2.0, $p < 0.001$), followed by a significant decrease of 5.2% until the end of February 2021 (95% CI −7.1 to −3.3, $p < 0.001$) and even greater significant 20.2% decrease in March 2021 (95% CI −33.2 to −4.5, $p < 0.05$).

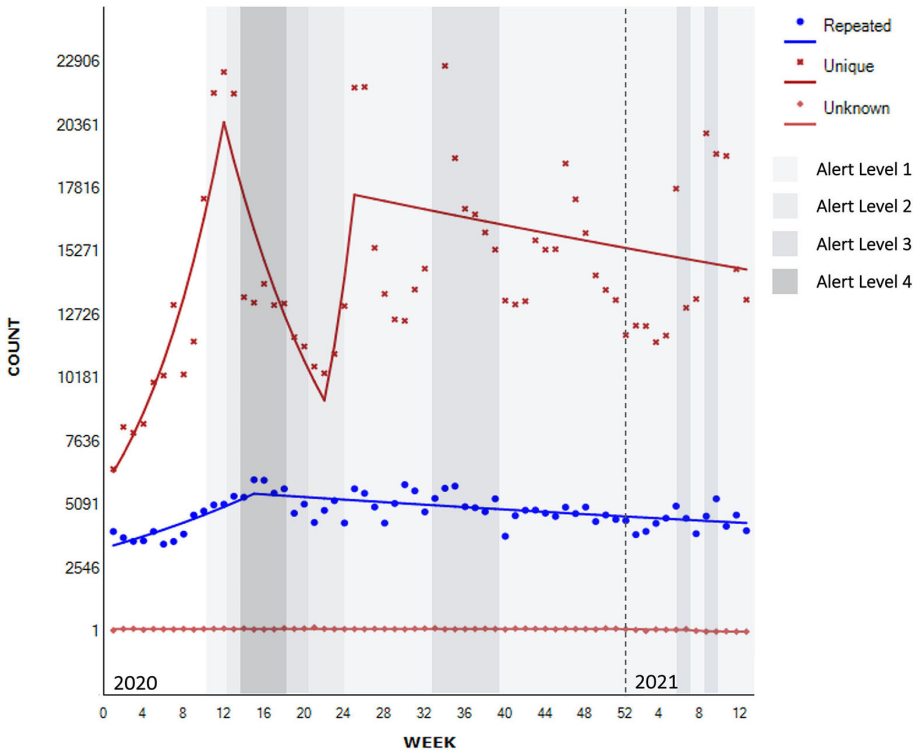

FIGURE 3 | Segmented regression analysis for unique/repeated contacts to national helplines (N_{known} = 1,220,886).

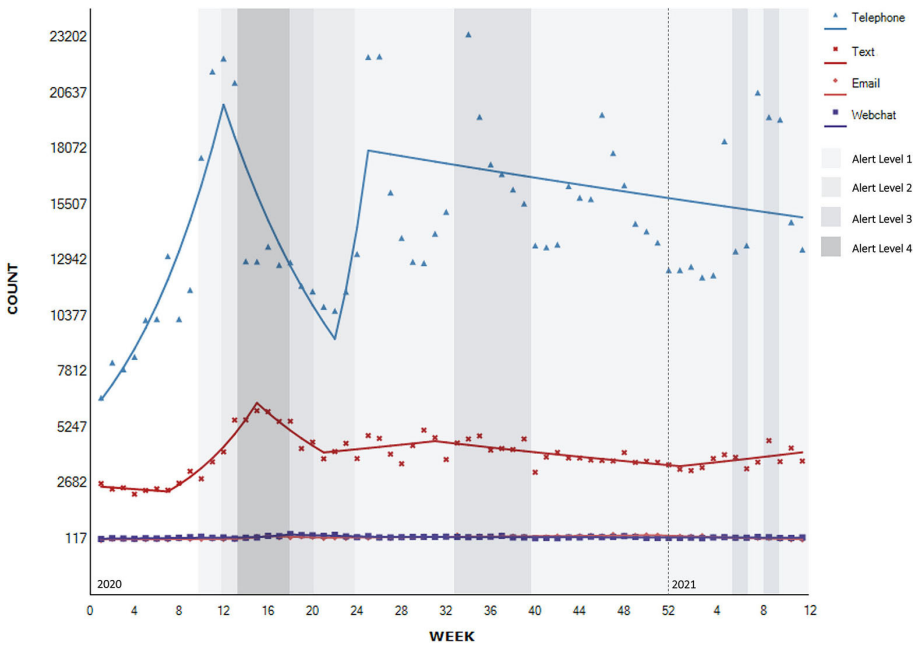

FIGURE 4 | Segmented regression analysis of contacts to national helplines per contact type (N = 1,227,140).

There is evidence of a significant 3.0% increase in contacts by webchat up until week 15 (January to the beginning of April 2020) (95% CI 0.9–5.1, $p < 0.05$), followed by a further non-significant increase of 17.3% until week 18 (95% CI −16.0 to 63.9, $p = 0.342$), then a significant decrease of 5.2% to week 26 in June 2020 after transition to Alert Level 1 (95% CI −9.1 to −1.0, $p < 0.05$), followed by a significant decrease of 0.5% after this time (95% CI −0.8 to −0.1, $p < 0.05$).

During the qualitative interviews, provider participants reflected on the changes in methods of contact (e.g., calls, texts, webchat) with observations mainly consistent with the observed quantitative data. Across helplines there was variability, with some noticing more calls, and others more texts, webchat and social media use, the latter particularly associated with younger service users. Interestingly, participants did not mention increases in emails, although this is evident in the quantitative data.

General Practitioners described an increase in the use of video consultations during lockdowns, but also noted that it did not last and was not necessarily that widespread across the country "*it was variable in terms of the level of system support and infrastructure by the organisation to support the staff and the patients to engage in a virtual consult […..] around 90% of all of the virtual consults during the lockdown period were by telephone, they were not by an audio-visual, not by AV, or video connections […] everybody has this perception that everybody was Zooming…*" (Participant 5)

Many provider participants described increased duration of contacts with service users going into more depth about their difficulties or contacting services more often. Participants felt that service users wanted to talk about general topics such as life and politics, rather than just health related topics. Participants suggested that social isolation and loneliness were behind the changes in call types to longer, more frequent calls on general non-distress related topics particularly for older people and mental health users unable to access social support. Some described an increase in prank calls.

> "*The volunteers certainly felt [...] that some of the conversations did go deeper, [...]calls got longer. So I can't remember the numbers off the top of my head, but a lot of, a lot more calls were over ten minutes and a lot more calls were over 30 minutes than [in] the prior months.*" (Participant 2)

> "*We had longer conversations with people, you know, with clients, you know more varied constant issues. Less about why they with our service [..], more about their life, more about their kids*" (Participant 6)

> "*They want to talk about their political views for an hour or more*" (Participant 16).

Age

All of the helplines provided monthly information the age of service users. For one helpline only the contacts under 25 years old were flagged, while the other contacts age remained unknown. The demographic data including age ($N = 757{,}218$), gender ($N = 800{,}251$), and ethnicity ($N = 664{,}897$) were analysed by month. Overall, there was evidence of a change in number of contacts, per month, by age group (**Figure 5**).

Specifically, for the full range of observations, for young people up to 25 years, the timeseries analyses showed evidence of a non-significant upward trend of 3.9% in number of contacts [95% CI −2.7 to 10.9, $t_{(14)} = 1.1$, $p > 0.05$]. Within this trend, the analyses showed evidence of a non-significant increase of 24.7% in the number of contacts between January to March 2020 (95% CI −24.3 to 105.3, $p = 0.348$), followed by a continued slower non-significant increase of 0.8% after this time (95% CI −1.7 to 3.3, $p = 0.515$).

A similar pattern was observed for those aged 25 to 64 years and 65 years or older. There was evidence of a non-significant upward trend of 6.4% for the full range of monthly observations [95% CI −7.7 to 22.7, $t_{(14)} = 1.0$, $p > 0.05$] for those aged 25–64 years and 3.6% [95% CI −3.4 to 11.2, $t_{(14)} = 0.9$, $p > 0.05$] for people aged 65 years or older. The analyses further showed that within these full period trends, there was a non-significant increase in demand of 62.2% between January and March 2020 (95% CI −45.5 to 385.5, $p = 0.345$) for people who were 25–64 years old, and 38.0% for those aged 65 years and older (95% CI −19.4 to 136.4, $p = 0.211$). For those aged 25 years and older, this initial increase was followed by a slight non-significant decrease from April 2020 (25–64 years old: AMPC −0.8, 95% CI −5.5 to 4.1, $p = 0.717$; 65+ AMPC: −1.2, 95% CI −3.7 to 1.4; $p = 0.335$).

For those whose age was unknown the trajectory of the demand was similar to those aged 25 years or older. There was evidence of a non-significant upward trend of 0.7% for the full range of monthly observations [95% CI −4.3 to 6.0, $t_{(14)} = 0.3$, $p > 0.05$]. Within this trend, the analyses showed a significant increase in contacts of 44.4% between January and March 2020 (95% CI 13.4–84.0, $p < 0.05$), followed by non-significant decreases of 15% until June 2020 (95% CI −32.4 to 6.8, $p = 0.136$) and further 1.6% for the remaining period (95% CI −3.8 to 0.5, $p = 0.114$).

The interview data suggested a substantial focus on young people, highlighting higher demand from people of younger age although this is not reflected in the quantitative data. Some participants viewed older people as more resilient with younger people experiencing more precarious conditions in general.

> "*People who, or 16–25, you know, suddenly - they've already been worried senseless about climate change and suddenly this has happened. This has all happened at a time when they're going through their last two years of school and trying to get into University and complete a degree. And everything is shut and they're having to do everything on their own at home and if they need space and peace. Just huge worries about what the future holds*" (Participant 16).

> "*Thinking into those who have just graduated about just trying to get work. And I am seeing it, and very anecdotal but yeah, it suddenly occurred to me we're getting people ring us going I can't get a job. I can't go overseas, I don't know what to do with my life. I don't know where I'm going, you know, I'm out of, you know, the world's out of control, I'm out of control. Yeah, so I think will play out over several years now.*" (Participant 1)

Other participants highlighted that COVID-19 control measures resulted in older people, particularly those of Asian descent, contacting helplines more often than usual. This was attributed to this population experiencing more loneliness as a result of lockdown. However, in general, participants believed that older people might have had less reasons to worry—"*(they had) more*

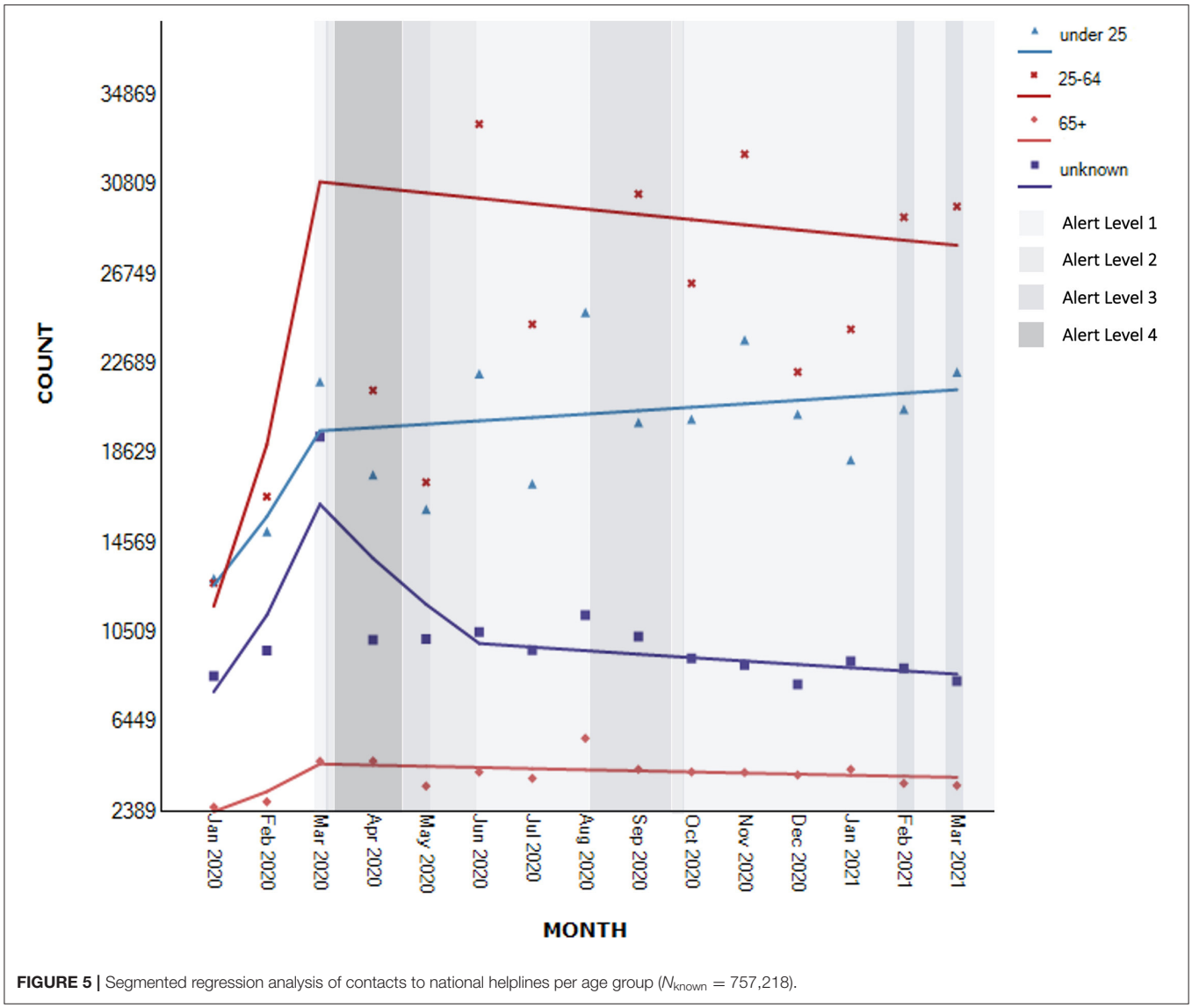

FIGURE 5 | Segmented regression analysis of contacts to national helplines per age group (N_{known} = 757,218).

secure sources of income, their jobs were more stable than the young ones and their casual contracts" (Participant 3).

One participant noted that younger people had greater difficulty adjusting to the loss of freedoms. Participants also suggested that those in their middle years were having difficulty combining work from home and home-schooling children in the family.

Gender

Only eight helplines collected information about contacts' gender and only seven included gender-diverse category in their reporting.

There was evidence of non-significant upward trends in the number of contacts for all genders for the full observation range [males: AMPC 5.3, 95% CI −5.5 to 17.3, $t_{(14)} = 0.9$, $p > 0$ .05; females: AMPC 5.1, 95% CI −4.2 to 15.3, $t_{(14)} = 1.1$, $p > 0.05$; gender-diverse AMPC 1.7, 95% CI −13.0 to 18.9, $t_{(14)} = 0.2$, $p > 0.05$].

As can be visually observed in **Figure 6**, within these trends, there was evidence of a high, albeit non-significant, increase in contacts from males between January to March 2020 (AMPC 51.3, 95% CI −33.7 to 245.3, $p = 0.289$), followed by a modest decline after this time (AMPC −0.9, 95% CI −4.6 to 3.0, $p = 0.619$). A similar pattern was observed for females (January to March 2020: AMPC 48.9, 95% CI −26.9 to 203.3, $p = 0.240$; April 2020 to March 2021: MPC −0.8, 95% CI −4.1 to 2.5, $p = 0.588$). For those reporting diverse gender identities, there was evidence of a high but non-significant increase of 51.3% from January to March 2020 (95% CI −14.4 to 167.6, $p = 0.129$) followed by a non-significant decline of 29.3% until June 2020 (95% CI −67.4 to 53.7, $p = 0.327$) and a gradual but non-significant increase of 5.1% thereafter (95% CI −0.2 to 10.8, $p = 0.058$). The number of people who did not report their gender declined significantly by 2.3% for the entire period of observation [95% CI −3.7 to −1.0, $t_{(14)} = -3.7$, $p > 0.05$].

There were suggestions by some interview participants that there was a change in the difficulties males called for help with, including being victims of family violence and fathers contacting helpline services to enquire about how to support their childrens' well-being.

The interviewees also suggested that, for some, subject to pandemic control measures triggered personal reflections, such as reflections about one's relationships, own gender-identity and sexuality:

> "*People just having a bit more time, some stuff around identity, maybe they'd kind of been pushing down or ignoring. But suddenly you're just stuck there with lots of time to think and say "well, actually…" So I think some of that definitely did come up for people.*" (Participant 2).

Ethnicity

Only seven helplines collected information about ethnicity. Of those, only six included MELAA as a category. There was evidence of non-significant upward trends for all ethnicities for the entire period of observation [New Zealand European/Pākehā: AMPC 5.7, 95% CI −4.7 to 17.2, $t_{(14)} = 1.0$, $p > 0.05$; Māori: AMPC 4.0, 95% CI −2.8 to 11.2, $t_{(14)} = 1.1$, $p > 0.05$; Pacific Peoples AMPC 2.7, 95% CI −0.7 to 6.2, $t_{(14)} = 1.7$, $p > 0.05$; Asian AMPC 0.6, 95% CI −2.9 to 4.2, $t_{(14)} = 0.4$, $p > 0.05$; MELAA AMPC 0.9, 95% CI −1.9 to 3.8, $t_{(14)} = 0.7$, $p > 0.05$; Other AMPC 2.0 95% CI −2.0 to 6.2, $t_{(14)} = 1.1$, $p > 0.05$– see **Figure 7**].

Within these trends, there was a moderate non-significant increase in contacts by New Zealand European/Pākehā between January and March 2020 (AMPC 45.4, 95% CI −34.3 to 221.8, $p = 0.318$), followed by a more modest non-significant increase after this time (AMPC 0.2, 95% CI −3.3 to 3.9, $p = 0.895$). A similar non-significant moderate increase from January to March 2020 was observed for Māori (AMPC 33.1, 95% CI −20.5 to 122.9, $p = 0.244$), but followed by a small non-significant decline (AMPC −0.2, 95% CI −2.6 to 2.2, $p = 0.837$).

For those whose ethnicity was missing, there was evidence of a non-significant increase in contacts between January and March 2020 (AMPC 41.8, 95% CI −16.3 to 140.2, $p = 0.171$) followed by a significant decrease in contacts after this time point (AMPC −4.6, 95% CI −7.3 to −1.8, $p < 0.05$).

Segmented regression analyses for contacts from Pacific Peoples, Asian, MELAA and people identifying with "Other" ethnicities did not identify additional joint points and is equal to trends described for the full range of observations.

Participants noted an increase in contacts from members of Asian and Pacific populations particularly by services that catered specifically for these populations which is not reflected in the quantitative data. These participants suggested that a large proportion of these contacts were from recent immigrants and international students. For Pacific Peoples, "*they may have been on seasonal work*" (Participant 7). Participants noted that Chinese and Korean people experienced increased prejudice and discrimination, and that Asian small business owners were highly affected. A few participants noted an increase in family violence in Asian communities, for both men and women.

> "*This guy was ringing because he usually got his socialisation at the pre-school where he would meet other parents and parents would talk about children and stuff. Now he had nobody, he didn't have access to anyone because, you know, the pre-schools had closed down.*" (Participant 7)

Asian service users were also thought by providers to be more concerned about (the implications of) COVID-19 because "*both for China and India, the COVID 19 situation back home was far worse*" (Participant 19) with immigrants and refugees experiencing anxieties about families "back home":

> "*We [in New Zealand] may have shifted from COVID, the rest of the world hasn't so that's still quite heightened in their mind so and kind of like family [overseas] passing away and they're coming with grief…* " (Participant 24).

Socio-Economic Status

Participants described the economic consequences of COVID-19 pandemic such as job losses, financial worries, and general uncertainty about the future as provoking increased anxiety. Participants noted that those with lower socio-economic status (SES), precarious work, living in impoverished areas or in overcrowded houses were most affected.

Interviewed participants also noted people "*calling [...] because of the loss of income. But that might be one person and you have a family of eight, but only one income*" (Participant 7).

> "*COVID-19 might have a devastating effect on those already known to be at risk compared to second comparatively large cohort of nearly at risk people, mainly experiencing once in their lives due to changing reality*" (Participant 21).

Participants discussed an increase in calls from people employed in certain sectors including airlines, travel, hospitality, and small-business owners. These people were calling with economic concerns that were new and a consequence of COVID-19 pandemic control measures.

Regional Variations in Demand

The qualitative data suggested regional variations in demand, particularly from more remote areas and areas experiencing deprivation. In answering a question about what geographic areas do participants think were the most affected, one participant noted—"*low, those are known as the Hood. You know, so low socio-economical areas (there are) probably a lot of areas across New Zealand that are like the Hood (…) You know, it's [help] slower to get to them.*" (Participant 4).

People from areas like "*Queenstown District Council, [that have been] significantly affected by the socio-economic impact of COVID*" (Participant 21) and the Auckland region due to additional lockdowns. In particular, the demand from "*Pacific people in South Auckland [*were noted as*] there were increased levels of distress*" [in the context of a cluster in this community] (Participant 5).

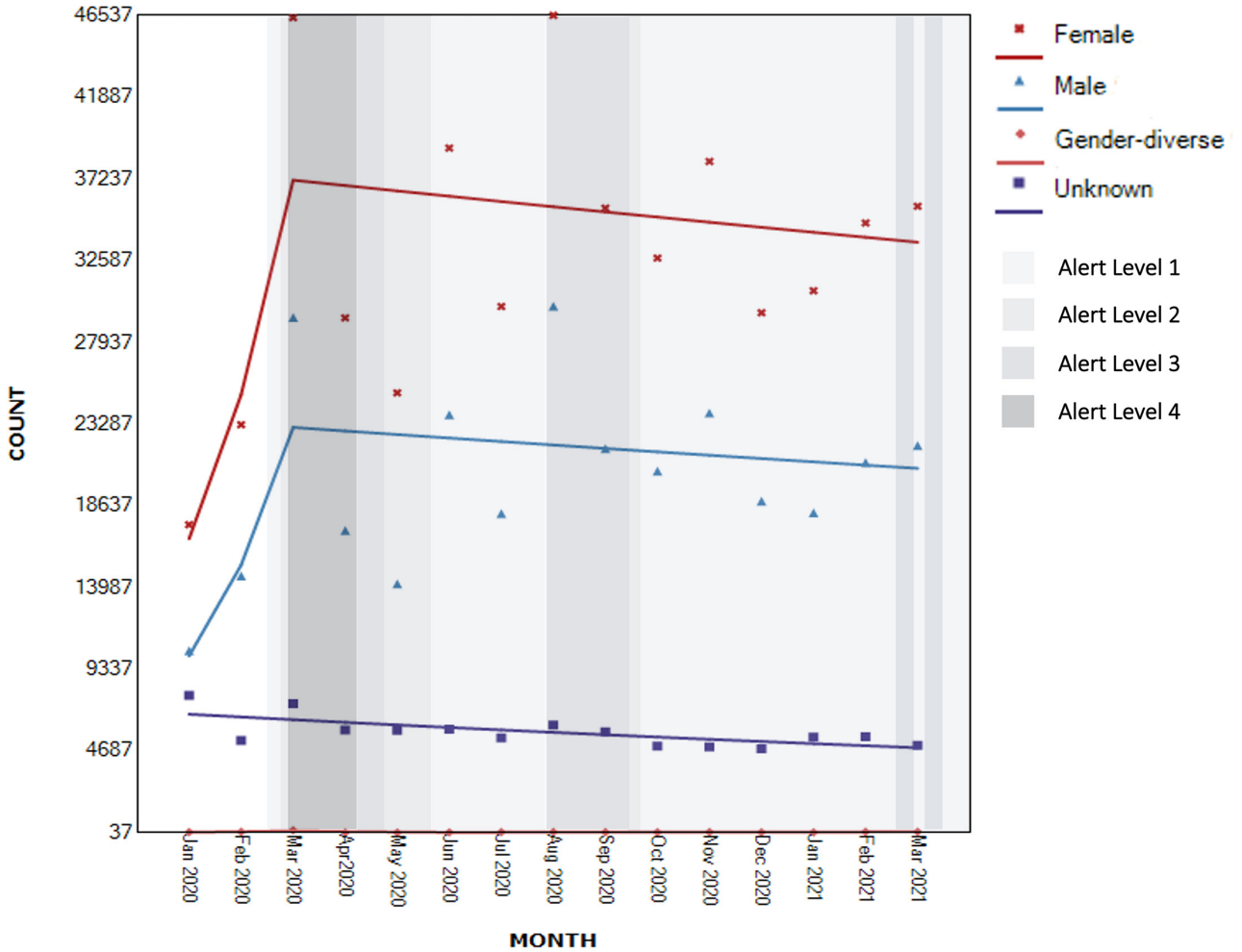

FIGURE 6 | Segmented regression analysis of contacts to national helplines by gender (N_{known} = 800,251).

Changes in Types of Concerns Related to COVID-19

COVID-Related Health-Related and Generalized Anxiety

Interview participants in both helplines and General Practices described a number of service users expressing anxiety about COVID-19 infection as well as general illness. People were anxious because they did not know how to behave—"*should I go visit Grandma? Shouldn't I go visit go Grandma?*" (Participant 20) and were concerned about their own family members not following the rules. Some participants noticed concerns about vaccination.

General Practitioners noted anxiety about decreased access to care, which manifested differently for different types of populations: in higher SES-area people "*were more angry that they couldn't just walk in to the practice*," for lower SES-area practice people were questioned "*what if I die and I can't come in? What do you mean I can't come in?*" (Participant 3).

General practitioners observed higher levels of somatization (e.g., medically unexplained headaches, muscle pain, etc.).

> "*They didn't ring up to say, you know, I'm feeling depressed and anxious. They had physical symptoms, not necessarily COVID related, like muscular skeletal and headaches and I found it wasn't long before you just got the anxiety. So, I'd say, you know, what are the headaches, when did they start, and all of this. A lot of these people have casual contracts with places and, "You know, my employer has said if we're locked down for another week, then I'll be given my notice, you know, I won't be able to…", those kind of things. So obviously, a lot was playing on people's minds already, which is really interesting, eh, 'cause I thought, well, I suppose people still want to talk to their doctor about their health.*" (Participant 3)

> "*I feel like I've seen more people with somatic complaints that are probably more to the more psychological medical through all of this […] I don't know whether people are just more sensitive to their inner workings at the moment.*" (Participant 8)

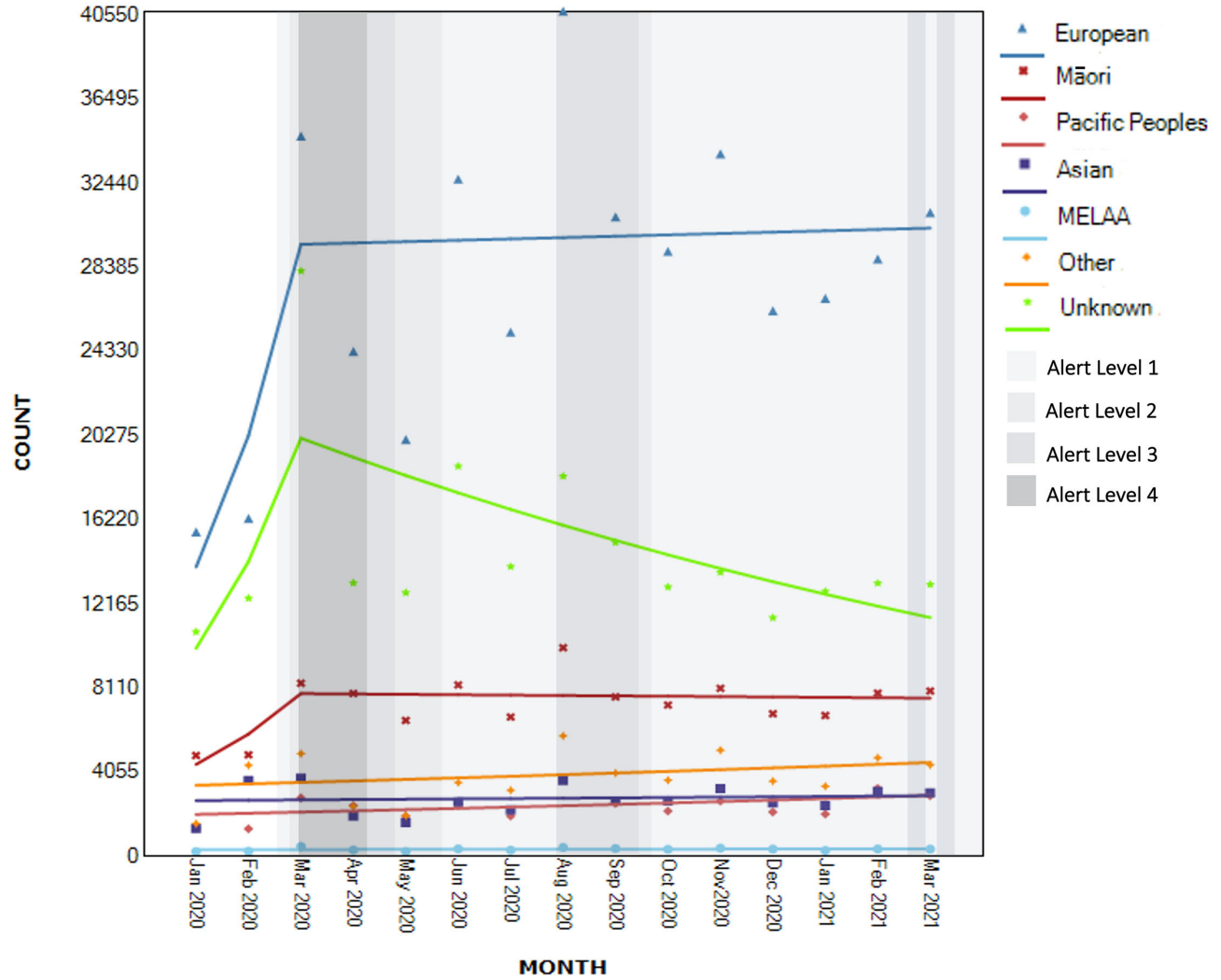

FIGURE 7 | Segmented regression analysis of contacts to national helplines by ethnicity (N_{known} = 664,897).

Lockdown-Related Concerns

Participants noted a potential increase in service users expressing feelings of social isolation and loneliness, especially during lockdowns.

> "*. . . when COVID and lockdown happened it sort of, to a large extent, decreased that sense, the mobility and restricted contact. And a lot of people just felt very socially isolated. So I got a lot of calls in terms of just feeling alone and lonely.*" (Participant 20)

Some participants noted that lockdowns were challenging for their target population because of lack of space and loss of freedom. These concerns appeared to be exacerbated by difficult relationships.

> "*There was one [...] quite a striking example. Someone that reached out who had the day before the initial lockdown, had just broken up with their partner and suddenly wasn't able to leave [...] in a very small apartment and was really struggling, was really struggling*" (Participant 9)

For some, being locked-down triggered personal reflections and the need to reconcile.

> "*Some current things that are coming up is having people [...] holding on to things that they hadn't confessed to their partners, that happened seven weeks, seven years ago. And they've decided that it's coming up now during COVID, and they wanted to break out and talk about it.*" (Participant 17).

Participants also described increases in family violence that were thought to stem from the lack of coping strategies:

> "*People are stressed out but are not talking about it, they're bottling it up. They're coping, they have poor emotional regulation, poor coping skills. So we're just talking about that, of course it's a long process to change the mindset*" (Participant 19)

Demand From People With Pre-existing Mental Health Symptoms

Interview participants highlighted a perception that service users with pre-existing anxiety suffered more. "*Lockdown was a mission for people who were really anxious, [people with] obsessive compulsive disorder, anxiety disorder problems*" (Participant 16).

In addition, there was a sense that presentations reflecting serious mental illness rather than general psychological distress had increased such as "*presentations of psychosis where people are saying that, you know, seeing and hearing voices and describe them [...]. That trend has been in place for several years now, but it seems to have been accelerated by the lockdown experience*" (Participant 1).

Participants also reflected on their perception of increases in crisis calls particularly for younger participants.

> "*We're talking about high to moderate suicide ideation, high to moderate concerning levels of self-harm. So these are not people just telling me they've cut themselves and this is a wee scratch and has stopped bleeding. But people are describing their wounds as quite serious. We're seeing very high levels of things that we never really saw before and it is part of a growing, a continuing trend I'd say, but it seems like COVID-19 has accelerated it.*" (Participant 1).

Protective Effects of COVID-19 Related Measures and Feelings of Social Cohesion

Helpline workers and General Practitioners noticed a potential protective effect from COVID-19 control measures where people felt part of a community. Participants noted that among some of their regular callers who struggle with social anxiety and the business of everyday life, there was a sense of relief.

> "*A lot of people had consciously decided to make changes and as to how they connected with each other and how they connected with their neighbours. A lot of people had decided to do, have less time, less TV time maybe and more connection. A lot of people had, that I've heard of, they had decided to keep their family debates, you know, they're debating things, and retained their board games, they bought the board games back on.*" (Participant 6)

Other COVID-19 pandemic control measures related improvements were seen in areas of non-domestic sexual assault, particularly for younger people, relief from gambling, alcohol use and self-harm due to the inability to access means.

Changes Not (Directly) Related to COVID-19

Although some COVID-19 concerns were novel, participants warned against attributing any increases in demand solely to COVID-19 pandemic, and spoke about how the COVID-19 pandemic and control measures simply exacerbated problems that already existed. Participants noted that year-on-year growth in demand for helpline services has been apparent for several years.

> "*I think we have to be very, very careful. ……. whilst we'd seen an uplift in the last twelve months in volumes, my belief is that is not necessarily attributable to COVID. Because it's no greater uplift than what we have seen over the last five years into the services. The growth rate actually over the last year has been less than the growth rate had been in the previous four years. And so there's actually an argument the volume is higher but the growth rate if you look back in 2019, 18, 17, [. . .] was higher in those years than what it was last year.*" (Participant 14)

Participants also highlighted other traumatic events experienced in Aotearoa/New Zealand in 2020 including earthquakes, Christchurch terror attacks, White Island volcano eruption, elections, police shooting, political protests, and a threat of tsunami.

> "*There were other things that happened too as well, like Whakaari/White Island, there was anticipation around the hearing for the Mosque shooter. So COVID wasn't the only context in which we were working.*" (Participant 12)

The Role of Promotion and Media

Participants attributed increases in demand to increases in health promotion, including promotion for helplines by central government. There was a sense that this was particularly true for youth, and due to social media promotion strategies "*because younger audiences, that seemed to be who the algorithm was driving the, the posts to*" (Participant 2).

Areas for Improvement in Healthcare Infrastructure Overall

The helpline interview participants suggested that increased demand from mental health service users and more crisis calls reflected their perception that mental health services are struggling to cope with demand. Participants felt that District Health Boards lacked surge capacity and barriers to accessing mental health treatment such as understaffed services, waitlists and strict eligibility thresholds made calling helplines easier and "*you (don't) have to yell at everybody that attracted the police to your home*" (Participant 7).

Some populations (e.g., Pacific Peoples, Asian) were perceived as being more likely to be excluded from access to general healthcare due to immigration status, financial or language problems. Remote and poorer areas were perceived as being "*the last place to get stuff*" (Participant 4), exacerbated by the fact that people in such settings are "*very reluctant to contact local services within small communities, 'cause they all know each other*" (Participant 1).

Participants raised concerns about the current healthcare infrastructure. They felt that current healthcare services are fragmented with insufficient information technology (IT) infrastructure and workforce expertise to support telehealth services infrastructure (especially in relation to video-calling).

> "*The mental health services in District Health Boards were trying to figure, I mean they came from a prehistoric start point in terms of delivering care virtually. District Health Boards are the most cumbersome slow to change services that we've probably got.*" (Participant 16)

Participants acknowledged that COVID-19 pandemic sped up innovation and cooperation, potentially improving services effectiveness and accessibility. However, the sustainability of such innovations and the risks of reverting back to normal were noted:

> "*If you haven't seen somebody after three days, what we found was that we actually needed to pull the staff out into the community to go and actually physically see people from the door. What we found was that a couple of people had been re-admitted back into the mental health unit. Because on the phone, they were like, okay, okay, but you didn't know that they haven't slept for three days? [...] there was on guy that nearly had his leg amputated. He didn't want to tell, he felt embarrassed to tell our support worker because he felt like, you know, he hadn't looked after himself, or he hadn't done, and that was, that was somebody with mental health.*" (Participant 7).

> "*In Christchurch after the earthquakes, it revolutionised the delivery of health care in Canterbury. Everything that they'd relied upon to run a health service got thrown in the air. And for two years they were able to make changes on a scale that had never been seen before all of which are fantastic. But then in about year 4, 5 and 6 they started to just to revert back, not completely, but I'm just wondering how that's going to go. I'd love to see us learning from this in everything from climate change through to normal health care. I think that it's time for [services] to deliver care in a far, far more responsible and meaningful way, it is so overdue now.*" (Participant 16).

DISCUSSION

The population of Aotearoa/New Zealand were subject to strong pandemic control measures, and a hard lockdown commenced in March 2020. There were concerns the COVID-19 pandemic could have a negative impact on mental health at a population level. Early self-report surveys suggested increased psychological distress in the community, although there was considerable variation in the study findings, and many studies had methodological shortcomings [for review see (5)]. In any event, the Aotearoa/New Zealand Government invested in a population level mental health intervention *Kia Kaha, Kia Māia, Kia Ora Aotearoa: COVID-19 Psychosocial and Mental Wellbeing Plan* (16), which included funding and promoting of a range of helpline and telehealth services, both new and existing.

This mixed methods study is the first of its kind internationally to have examined changes in patterns of demand for national telehealth services before and during the COVID-19 pandemic period, with variations described in terms of gender, ethnicity, age, mode of contact and reasons for contact. Between January 2020 and March 2021, New Zealand-based helplines included in this study received a total of 1,244,293 contacts of which nearly three quarters of the contacts were unique, and a quarter repeated. The majority of these were telephone calls, followed by text, webchat, email, and other methods. Nearly two thirds of those who contacted services were female (62%) and more than half were 25–64 years old. Two in five contacts were from people under the age of 25 years and only a small proportion were over 65 years. The demographic representation is similar to such observed in other international studies (25, 26). The majority of those who contacted services were of New Zealand European/Pākehā ethnicity (63%), followed by Māori (17%), those who identified as 'other' ethnicity (9%), Asian (6%) and Pacific Peoples (5%).

There was a significant 12.4% increase in contacts between January 2020 and March 2020 when the COVID-19 pandemic was declared and New Zealand went into a hard lockdown in late March. Further spikes in contacts coincided with national and regional lockdowns and the introduction of a new helpline in mid 2020. Our findings are consistent with international studies showing helpline service demand increased following lockdowns or spikes in infection rates (22–26), followed by decreased demand (22–24, 26). Moreover, although there was a gradual 0.5% decline in contacts after the first national lockdown, and we have seen some peaks and troughs during regional lockdowns, the overall demand stabilised at a new, higher level with an overall upward trend. This indication of a new higher level of demand based on longitudinal data is a novel finding, although the gradual increase in demand throughout the study period did not reach significance levels. We note that the increases and decreases in demand were more consistent with observations in Australia (∼8% and 3% respectively) (22) and not the observations from the United States or Romania (∼50% increase) (23, 25), albeit the Australian data was youth-related. Notably, it is important to acknowledge that qualitative data has shown that contacts to helplines had been already increasing prior to the COVID-19 pandemic control measures, similar to observations by the longitudinal Australian study (22).

Kia Kaha, Kia Māia, Kia Ora Aotearoa: COVID-19 Psychosocial and Mental Wellbeing Plan (16) encouraged new users to make contact with support services, and there was a 11.1% increase in new contacts January to March 2020 followed by non-significant but important increase of 23.6% following the introduction of a new helpline and extensive national health promotion in June 2020. In addition to the new contacts, there was also evidence of a significant 3.4% increase in contacts from repeat service users leading up to and at the beginning of the Alert Level 4 lockdown. Key informant interviews attributed the increase in new contacts to the mental health promotion campaign (i.e., public service announcements on national television, social media channels, public health promotions in public spaces via banners, in transport etc.) that normalized psychological distress in the context of the pandemic. Providers emphasized that increased demand could be viewed positively and as a successful outcome of public health promotion messaging. In fact, the higher rate of the demand increase, although not significant, might indicate that the promotional campaign has a delayed lifecycle. Importantly, increased contacts from first time users supports this hypothesis, however, increased contacts by regular users could also indicate additional distress within the community. Participants also reported more contacts from family members and peers asking about how to support others rather than the more typical pattern of people seeking support for themselves. A similar dynamic regarding concerns for the loved ones and an increase

in family-related and relationships-related contacts was observed in Australia (22) and Greece (31).

Different patterns of demand were seen across different modes of contact; text contacts nearly doubled at the beginning of the first lockdown under Alert Level 4 with a small but significant 0.8% increase across the study period. There was an increase in contacts by email up to December 2020. The timeseries data showed that digital contacts by text, email, and webchat increased during the first lockdown under Alert Level 4, while phone contacts dropped. This suggests that some people felt contact by digital means was more private or practical during lockdown periods. Similar increases in contacts by digital methods, particularly Webchat during lockdown, have been observed in Australia among those contacting a youth helpline (22). The fact that only text contacts showed the significant upward trend throughout the study period might indicate that text is becoming a more popular method of contact in general and should be considered by telephone-only helplines.

Earlier studies suggested that younger people were more likely to be affected by the COVID-19 pandemic (7, 11, 13), and our study found that contacts by young people under 25 years increased throughout the study period, whereas contacts by people those older than 25 years gradually declined once the first lockdown lifted. In addition the number of over 65 year olds contacting services was smaller than by people under 65 years, similar to other studies (30).

Although the pattern of demand from males and females was similar—increasing leading up to the first lockdown and gradually declining thereafter—qualitative observations suggested more contact from males seeking support for other family members and as victims of family violence. Contacts for gender-diverse populations increased from January to March 2020, followed by a decline during the period of the first lockdown, and followed by another increase thereafter. We note that comparative to the Australian data (22), demand from males showed a higher percentage increase than the demand from females. Our results are similar with regards to gender-diverse population.

Among Māori, there was a non-significant increase in demand leading up to the first lockdown followed by a gradual decrease of 0.2%, in comparisons to other ethnic groups that saw an increase in demand. Māori experience systematic inequities in access to healthcare services and the observed pattern of demand may either reflect greater resilience among Māori communities or, alternatively, a lack of fit between Māori health needs and helpline and telehealth support approaches. A non-significant increase was observed by members of the community identifying with Asian, Pacific, MELAA and "Other" ethnic identities across the study period, which contrasts with the New Zealand European/Pākehā demand that had a larger, but also non-significant increase leading up to the first lockdown, and a gradual increase of 0.2% thereafter.

Service providers reported that some callers were reluctant to overload their usual service providers, or some were having difficulty accessing these (20, 21). From a qualitative perspective, providers attributed the increase in helpline demand between January 2020 and the end of March 2021 to COVID-19 related anxieties such as fears of infection, general anxiety about accessing healthcare, uncertainty about COVID-19 rules, questions about vaccination, and feelings of loss of control similar to other international studies (25, 26, 30, 31) and observations in Brooks and colleagues rapid review (2020). Although, similar to the data from Greece and Malta (26, 31), our qualitative results indicated potential increases in generalized anxiety; however, depression has not featured strongly in our data. Similar to the Australian youth helpline study (22), our qualitative data also pointed at higher crisis calls related to suicidality and self-harm in youth.

The population of Aotearoa/New Zealand were subject to strong pandemic control measures, and a hard lockdown commenced in March 2020. Qualitative data suggested that for some, the experience of lockdown was stressful due to feelings of loneliness and social isolation or, conversely, due to inability to separate from others. The former may be especially relevant for communities who hold collectivistic values (e.g., Māori, Asian, Pacific Peoples), elderly, and people with pre-existing mental health conditions. The latter was exacerbated by difficult relationships or younger age and the loss of freedom as observed in international studies (22, 30, 31). Service-providers described increased duration of contacts with service-users going into more depth about their difficulties, or contacting the service more often. Participants felt that service-users wanted to talk about general topics such as life and politics, rather than just health related topics due to social isolation or loneliness.

Helpline workers and General Practitioners noted some protective effect of the COVID-19 control measures where people felt they were a part of a community and among some of their regular users with social anxiety and the business of everyday life, there was a sense of relief. Some providers also noted there were fewer clients seeking help for non-domestic sexual assault, particularly among younger people, relief from gambling, alcohol and self-harm due to the inability to access means during the COVID-19 control measures.

Service providers warned against attributing variations in demand solely to the COVID-19 pandemic, and felt that COVID-19 exacerbated existing problems. Participants noted that year-on-year growth in demand for the helpline services has been apparent for several years. The helpline interview participants suggested that increased demand from mental health service users and more crisis calls reflected their perception that mental health services are struggling to cope with the demand. General Practitioners also indicated difficulties in accessing community mental health services for patients due to eligibility thresholds leading to disruptions in continuity of care for people with mental health difficulties.

Participants raised concerns about current healthcare infrastructure including IT and workforce expertise to support audio-visual telehealth technology. Some participants felt that COVID-19 had sped up innovation and cooperation potentially improving access to services. However, the sustainability of innovations and the risks of reverting back to traditional approaches to delivery were noted. There is also a need to robustly appraise the innovations in practice that were rolled out

rapidly to ensure that the fundamentals of best practice have not been inadvertently compromised.

Although the quantitative data showed a stabilization and gradual decrease in helpline demand, it is mainly non-significant. This might be indicative of the fact that the impact of the pandemic has not yet passed, and economic consequences such as rising food and housing costs likely adversely affect the most vulnerable members of our community (40). Future COVID-19 infections, particularly the Delta strain, may have further impact, especially on populations who are already disproportionally affected. Disruption in healthcare access may be problematic and exacerbate chronic conditions or worsen prognosis (41, 42). Telehealth, although a great solution for many, might not be suitable for everyone, such as, for example, people with limited access to internet or mobile data or children or Māori who prefer kanohi ki te kanohi (face to face) consultations. More research is needed to understand the extent to which telehealth, both helpline services and telehealth in primary care, is congruent with the values of those seeking healthcare.

LIMITATIONS

First, the study analyzed timeseries of data from January 2020 until March 2021. However, the COVID-19 pandemic and pandemic control measures continue, and we anticipate re-approaching helpline providers in 2022 for further data. Secondly, it should be noted that demographic data is not uniformly collected by helplines leading to high non-report with some data (e.g., gender) that may be based on volunteers' judgment or be misrepresented by the contacts themselves to retain anonymity (e.g., age, ethnicity). Finally, quantitative analysis of ethnicity data should be interpreted with caution as other newer targeted helplines emerged during the COVID-19 with the aim to provide better cultural support, but not all of these had data available for inclusion in this study.

CONCLUSIONS

COVID-19 pandemic control measures were associated with an increase in contacts to helplines in Aotearoa/New Zealand. Variations in pandemic control measures resulted in a peak and trough pattern of demand, accompanied by a more general upward trend throughout the study period. Demographically, the demand from younger people saw the fastest increase. The demand increase from males was higher than from females, although females still represented nearly two thirds of all contacts. The demand from Māori saw a slow gradual decline, while the demand from other ethnicities continued to rise. More research is needed to understand how to provide targeted support for the populations who sought help from helplines more often. Additionally, whether the population who contacted helplines less often (i.e., older people, Māori) are more resilient and why, or whether there are other reasons for lower demand (i.e., lack of access, lack of cultural safety) should be explored. This will help to provide better systemic solutions.

Finally, although the reason for contacting helplines in Aotearoa/New Zealand were similar to those internationally, the extent of the demand increases was lower in Aotearoa/New Zealand possibly because of lower infection rates, COVID-19 related mortality, and bereavement at that time. Moreover, in Aotearoa/New Zealand the reasons for increases in demand were often beyond the COVID-19 pandemic. Future research to understand how other external factors such as other national events and emergencies, media communications, the state of economy, public health policy as well as the state of healthcare system in general may affect the demand for helplines and telehealth is urgently needed.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the ethics approval restricts us from sharing organizational data. Requests to access the datasets should be directed to Alina Pavlova alina.pavlova@auckland.ac.nz.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Auckland Health Research Ethics Committee (AH3109). All the organisations and interviewees provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SH and SF initiated the study. KW and AP conducted the quantitative analyses. BS and AP conducted the qualitative analyses. SH and SF supervised the drafting of the manuscript by AP. AP collected and prepared the data and interviewed the participants. All authors participated in the recruitment to the study and in active discussion in the process of writing of this study.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2021.791209/full#supplementary-material

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Suicidal Ideation Among Children and Young Adults in a 24/7 Messenger-Based Psychological Chat Counseling Service

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Background: Suicidality in children and young adults is a pervasive problem: approximately 40% of respondents in epidemiological surveys in German schools reported suicidal ideation, while up to 9% reported a suicide attempt in the past. While there is compelling evidence for the effectiveness of telephone-based hotline services, an increasing preference of adolescents for messenger-based counseling services can be observed. Therefore, the present study aims to investigate the utilization behavior and user satisfaction of users contacting a German messenger-based chat counseling service ("*krisenchat*") regarding suicidal ideation.

Methods: The present cross-sectional study analyzed retrospective anonymous data on sociodemographic variables, utilization behavior, and user satisfaction of *krisenchat* users who used the service between May 2020 and July 2021. Chi-square-tests were used to identify associations of sociodemographic characteristics and utilization behavior with suicidal ideation. Mann-Whitney-*U*-tests were used to compare the user satisfaction and the recommendation-to-others-rate between suicidal and non-suicidal *krisenchat*-users.

Results: In total, chat data of $N = 11{,}031$ users were collected. Of the $n = 6{,}962$ users included in the final analysis, $n = 1{,}444$ (20.7%) contacted *krisenchat* because of suicidal ideation. The average user experiencing suicidal ideation was 17 years old, female and currently not receiving other treatment. Further, suicidal ideation was significantly and positively associated with age and non-suicidal self-injury. Regarding utilization patterns, there were significant positive associations between suicidal ideation and counseling session count, mean amount of messages sent, and mean amount of words used per message by the user. User satisfaction was high, with 64.7% ($n = 413$) of users that answered the feedback survey and experiencing suicidal ideation rating the help they received as at least "good" and a recommendation rate of 89.6% ($n = 571$). Most importantly, no differences were found between users reporting suicidal ideation and those that do not regarding satisfaction and the probability of recommending the service.

Conclusion: Results imply satisfaction with the counseling service among users with suicidal ideation. Nevertheless, there is a need for further research into messenger-based counseling services regarding the prevention of suicidal behavior in children, youths, and young adults. Longitudinal studies are especially needed to assess the effectiveness of messenger-based interventions.

Study Registration: DRKS00026671.

Keywords: suicidal ideation (SI), suicide prevention, chat counseling, adolescent, e-mental health, online intervention, young adults, children

INTRODUCTION

According to the World Health Organization (WHO), suicide is responsible for 1 in 100 deaths worldwide, leading to the deaths of millions of people each year as well as long-lasting effects on the bereaved, such as challenges due to stigmatization and social isolation (1–3). In particular, suicide is the fourth leading cause of death among 15–29 year-olds worldwide and the second or third leading cause of death in adolescents in Europe (4). In Germany, 508 adolescents and young adults (male: 75%, female: 25%) from 10 to 25 years died by suicide in 2020 (5). Consistent with previous studies, girls and women were overrepresented in terms of suicidal ideation or attempts, while deaths by suicide occurred significantly more often in the male population (6–8). Furthermore, previous studies in German students found that up to 40% of students reported suicidal ideation and up to 9% reported suicide attempts (9).

Research on risk factors shows that non-suicidal self-injury (NSSI), psychiatric illness adverse childhood experiences, such as bullying victimization, physical, sexual, and emotional abuse, as well as suicidal bereavement, increase the risk for suicidal ideation or suicide attempts significantly (10–13). Accordingly, suicidality occurs in adolescents with and without underlying psychiatric illness and thus represents a highly relevant health as well as social issue. In line with this argument, the WHO recently published its LIVE LIFE guidance for suicide prevention to curb the number of attempts and deaths by suicide (14). One of the key strategies for suicide prevention outlined in this guide is to foster socio-emotional life skills and mental health literacy in adolescents. This may lead to a reduction in stigma and an increase in mental-health-related knowledge, which may encourage adolescents to seek help. Nevertheless, support and interventions need to be accessible to be able to have an effect on the target groups. The literature indicates that there still is a great need for accessible support and interventions, with 63% of people in Germany with mental health issues aged 18–34 years reporting having never sought help for their issues (15).

A number of barriers hindering the accessibility of mental health-related resources may (in part) explain the low rates of help-seeking found in youths. According to a recent review, such barriers include feared or actual stigmatization, mental health illiteracy, a perceived need for autonomy and self-sufficiency among youths as well as other structural factors such as travel times (16). Additionally, there may be systemic barriers for adolescents with low socioeconomic status, or a diverse background regarding culture or gender, that further limit help-seeking behavior in such populations (17).

As a previous suicide attempt is one of the most important risk factors for suicide in the general population, prevention is of vital importance to mitigate the relative risk of suicide in individuals (18). Unfortunately, research regarding the prevalence of (non-) help-seeking behavior in suicidal or at-risk adolescents and young adults is rather scarce. Nevertheless, the few available studies suggest that help-seeking behavior for suicidality is not common among at-risk adolescents (19, 20). For example, in a sample of 362 European youths, who were considered at-risk for suicidality at a baseline screening and completed a 12-month follow-up self-report, only 45 (12%) sought professional help (20).

Furthermore, a growing number of studies indicate that children, adolescents, and young adults turn to the internet for accessing mental health resources, as it is familiar, easy to access, affords anonymity and may satisfy the perceived need for self-reliance found in some youths and young adults (21–25). Recognizing this trend, a number of crisis hotlines and similar services started incorporating online services, such as chat or e-mail counseling, into their portfolios (26–29). Preliminary evidence suggests the general acceptance and satisfaction of users with those services. While there is not much readily available knowledge regarding the utilization behavior of general users of those services, even less is known regarding subgroups with specific mental health related symptoms like suicidal ideation. Thus, the current investigation focuses on the utilization behavior and user satisfaction of users contacting a German messenger-based chat counseling service ("*krisenchat*") regarding suicidal ideation.

MATERIALS AND METHODS

Description of *krisenchat*

krisenchat (German for "crisis chat") is a counseling service aimed at children and youths in need of general psychosocial support as well as in acute crisis and can be contacted free of charge, pseudonymously and 24/7 via WhatsApp or SMS. In addition to listening to, calming and comforting users in acute crises, the service engages on cooperative problem solving focusing on promoting users' self-efficacy. If indicated, users are referred to local support services and the health care system. The volunteer counselors have a professional background in

health or social work. Counselors are trained to monitor chats for acute suicidality or other acute threats rather than screen for clinical diagnoses. Evidence-based guidelines, including an overview of risk factors and screening questions to address sensitive topics, enable the counselors to assess the current situation and identify individuals at risk. In the case of acute suicidal tendencies, the counselors call an on-call service, staffed by doctors, psychotherapists, psychologists and social workers, which is available 24/7, with whom they discuss further support.

Participants and Procedure

Anonymized data from all chat users between May 17, 2020 and July 30, 2021 was extracted from the operational database for the purpose of this cross-sectional study. The extracted information included automatically-collected metadata on each chat (e.g., date and time of the first and last contact and total number of messages sent) and information collected and rated by the counselors (e.g., topic of a session). Users were asked to provide their feedback via an automatically generated survey invitation if their chats included at least 30 messages and were not regarded as at-risk of child welfare endangerment by the psychological team. The invitation link to the survey was sent via chat 6 hours after counseling. If users attended more than one session, the survey was only sent to them once after the first chat session. The survey was created using *typeform* in German language. Before participating in the survey, informed consent was retrieved via an opt-in question. Ethical approval was granted by the Ethics Committee of the Medical Faculty, University of Leipzig, on 08-03-2021 (file reference: 372/21-ek).

All in all, data of $N = 11{,}031$ users were extracted. Out of those, $n = 7{,}393$ received an invitation to participate in the subsequent survey. Criteria for exclusion were chats marked as "fake chats" by the counselors ($n = 115$, 1.0%; i.e., chats that were started by users without the serious intention of receiving a consultation or without an ongoing crisis), users indicating an age under 6 or over 25 years ($n = 2{,}414$; 21.9%), no chat topics identified by the counselors (e.g., missing data, or if the addressed concern did not indicate a need for consultation, $n = 1{,}539$; 14.0%) and missing response by counselors ($n = 1$; 0.0%). In total, the data of $n = 6{,}962$ users were included in the analysis. The subsequent survey was completed by $n = 2{,}762$ (39.7%) participants.

Measures

The current study evaluated utilization behavior and user satisfaction by analyzing automatically collected metadata and data assessed by counselors during or after the sessions. User satisfaction was assessed using information gathered from the feedback survey.

Suicidal Ideation

According to the ICD-11, suicidal ideation may be defined as any "thoughts, ideas, or ruminations about the possibility of ending one's life, ranging from thinking that one would be better off dead to formulation of elaborate plans" (30). In line with this definition, counselors at *krisenchat* are advised to use the tag *suicidality* during chat counseling to classify suicidal behavior, usually indicated by suicidal ideation or intent, preparatory acts, well-elaborated suicidal plans, suicidal attempts, and other suicide-related behaviors.

Utilization Behavior

Metadata as well as data on the users collected by counselors during chat sessions were used to evaluate utilization behavior. The metadata included information on the date of first and last contact, the total number of counseling sessions and, finally, the total number of messages and words during the entire consultation period. Data on users' age, gender, and prior or current use of professional help providers were collected and noted by the counselors during the chat, if users disclosed them. The addressed concerns of users were classified into categories by the counselors. Further information, e.g., where the users learned about *krisenchat* (e.g., social media, recommendation) was also asked in the feedback survey.

User Satisfaction

User satisfaction was assessed as part of the feedback survey using two items. The first item measured user satisfaction on a 5-point Likert scale ranging from 1 = "not at all" to 5 = "very well" by asking the users if the counseling was able to help them with their concerns. The second item asked users how likely they were to recommend the service to others via Net Promoter Scale (NPS; 31), with 0 indicating a 0% probability and 10 indicating a 100% probability of recommending the service to others. As the NPS was developed for marketing purposes, i.e., revenue and company growth, and as there are (to the best of our knowledge) no studies evaluating the psychometric properties of the measure, we elected not to compute the NPS as intended by Reichheld (31) in his original publication. Instead, we elected to interpret the NPS as an indicator of the probability of recommending the service to others on an individual level. Furthermore, according to Reichheld (31), customers or users recommending an organization or service "are also putting their own reputation on the line" (p. 1). As help-seeking for mental health may still be considered a stigmatized issue (16), we elected to use a more liberal cut-off as an indication for recommendation as the original author of the NPS (31). As such, a likelihood of >50% or more was considered as the cut-off to indicate that an individual would be more likely than not to recommend the service to others. Therefore, the likelihood of recommendation was recoded into a binary variable to assess the recommendation rate. Users scoring 6 or higher were assumed to be willing to recommend the service to others.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 27.0. A two-tailed $\alpha = 0.05$ was applied to statistical testing. Descriptive statistics were performed for sociodemographic variables, utilization behavior, and user satisfaction. Subgroup analyses were conducted using chi-square-tests to identify differences in suicidality regarding different sociodemographic user characteristics. The Standardized Pearson Residuals were used to decompose the effect of significant chi-square-tests (32). To gauge the effect size, the

ϕ-coefficent was calculated, while Cramér's V (ϕ_c) was used when the contingency table was larger than 2x2, with ϕ, ϕ_c = 0.10 indicating a small, ϕ, ϕ_c = 0.30 an average and ϕ, ϕ_c = 0.50 a large effect (33). Because of non-normality of the variables, *Mann-Whitney-U-tests* were used to compare utilization (session count, mean number of messages sent by the user, mean number of words used per message by the user) as well as topic patterns, the user-satisfaction and the recommendation-to-others-rate between *krisenchat*-users experiencing suicidal ideation, and those that did not. Pearson correlations were computed using the z-score of the *Mann-Whitney-U*-test-statistic and interpreted as $r = 0.10$ indicating small, $r = 0.30$ indicating average and $r = 0.50$ indicating large effect sizes (32, 33). Where applicable, Bonferroni Correction was used to account for multiple testing.

RESULTS

Sociodemographic Characteristics

A detailed description of sociodemographic characteristics and utilization is displayed in **Table 1**. Of the $n = 6{,}962$ users included in the analysis, $n = 1{,}444$ (20.7%) users contacted *krisenchat* displaying suicidal ideation. Of those who disclosed their gender, 84.4% were identified as female ($n = 1{,}065$), 13.2% ($n = 166$) as male and 2.5% ($n = 31$) as diverse. The mean user of *krisenchat* who reported suicidal ideation was 17 years old ($M = 16.50$, $SD = 3.25$), female, and currently not receiving treatment (62.4%, $n = 901$). Nearly two thirds (62.0%, $n = 320$) of all users that answered the item asking for professional help-seeking before contacting *krisenchat* and were additionally identified as experiencing suicidal ideation, reported that they had indeed sought professional help prior to contacting *krisenchat*.

Subgroup analyses indicated that there were significant associations between age and suicidality, $\chi^2_{(2)} = 8.8$, $p = 0.012$. An examination of the adjusted Pearson residuals revealed that significantly more individuals in the age group 14–17 were found to be experiencing suicidal ideation than expected, when compared to 7–13 and 18–25-year-olds and correcting for multiple testing. While 18.8% ($n = 250$) of 7–13-year-olds and 19.8% ($n = 449$) of 18–25-year-olds were found to experience suicidal ideation, 22.2% ($n = 745$) of the individuals aged 14–17 were found to experience suicidal ideation.

Furthermore, an investigation of the relative cell frequencies revealed that around 28.4% ($n = 31$) of individuals identifying as diverse, while 21.4% ($n = 1{,}065$) of users identifying as female and 18.8% ($n = 166$) of users identifying as male reported suicidal ideation. Nevertheless, while gender and suicidality were significantly associated, $\chi^2_{(2)} = 6.4$, $p = 0.041$, $\phi_c = 0.03$, an examination of the adjusted Pearson residuals failed to reveal any significant residuals after correcting for multiple testing.

Utilization Behavior

Descriptive statistics showed that roughly one third of all users experiencing suicidal ideation ($n = 489$, 33.9%) contacted *krisenchat* for the first time between 4:00 and 8:00 pm, while more than a quarter ($n = 410$, 28.4%) sought first contact between 8:00 and 12:00 pm and 10.6% ($n = 153$) contacted *krisenchat* between 12:00 and 8:00 am. This pattern did not differ from users contacting the service with concerns other than suicidal ideation, $\chi^2_{(5)} = 4.85$, $p < 0.434$.

Results indicate that 44.5% ($n = 642$) of all users experiencing suicidal ideation had more than one topic ($Mdn = 1$) with which they contacted the service of *krisenchat*, while 38.2% ($n = 2{,}107$) of those not experiencing suicidal ideation shared more than one topic ($Mdn = 1$) during the consultation. When compared, users experiencing suicidal ideation wrote about significantly more topics with counselors, $U = 3663908.00$, $r = 0.06$, $p < 0.001$; than users who did not suffer from suicidal ideation. Furthermore, significant positive associations were identified for suicidal ideation and NSSI, $\chi^2_{(2)} = 407.48$, $p < 0.001$, $\phi = 0.24$; being in current use of professional help services, $\chi^2_{(2)} = 317.94$, $p < 0.001$, $\phi = 0.21$; being lovesick, $\chi^2_{(2)} = 99.70$, $p < 0.001$, $\phi = 0.12$; and prior use of help services before contacting *krisenchat*, $\chi^2_{(2)} = 23.77$, $p < 0.001$, $\phi = 0.10$.While the topics depression, $\chi^2_{(2)} = 36.96$, $p < 0.001$, $\phi = 0.07$; school, $\chi^2_{(2)} = 30.70$, $p < 0.001$, $\phi = 0.06$; loneliness, $\chi^2_{(2)} = 14.64$, $p < 0.001$, $\phi = 0.05$; pressure because of expectations of others, $\chi^2_{(2)} = 18.05$, $p < 0.001$, $\phi = 0.05$; dealing with mental health issues of others, $\chi^2_{(2)} = 17.29$, $p < 0.001$, $\phi = 0.05$; COVID-19, $\chi^2_{(2)} = 15.98$, $p < 0.001$, $\phi = 0.05$; sexual harassment, $\chi^2_{(2)} = 8.25$, $p < 0.01$, $\phi = 0.03$; anxiety, $\chi^2_{(2)} = 7.80$ $p < 0.01$, $\phi = 0.03$; addiction, $\chi^2_{(2)} = 7.73$, $p < 0.01$, $\phi = 0.03$; and LGBTQIA+, $\chi^2_{(2)} = 4.72$, $p < 0.05$, $\phi = 0.03$; were also identified as being significantly associated with suicidal ideation, the estimated effect sizes were marginal.

Regarding utilization patterns, users affected by suicidal ideation attended on average $M = 6.0$ ($SD = 9.4$) sessions with a mean message count of $M = 28.7$ ($SD = 24.2$) during a single session and a mean word count per message of $M = 15.1$ ($SD = 9.3$). Those not affected by suicidal ideation, on average attended $M = 3.24$ ($SD = 4.97$) sessions, wrote $M = 22.68$ ($SD = 17.64$) messages per session and used $M = 17.46$ ($SD = 11.00$) words per message. In comparison with users not affected by suicidal ideation, those affected by it attended significantly more chat sessions, $U = 2974718.50$, $r = 0.18$, $p < 0.001$; sent on average more messages during a session, $U = 3256016.50$, $r = 0.13$, $p < 0.001$; and had a lower mean word count within a message, $U = 3432471.00$, $r = -0.10$, $p < 0.001$.

User Satisfaction

In total, $N = 633$ users experiencing suicidal ideation completed the survey on user satisfaction after the counseling. On average, two thirds of all users experiencing suicidal ideation ($n = 413$, 64.7%) were satisfied with the counseling service of *krisenchat*, indicating the service helped them with their concerns "well" or "very well." Furthermore, the computed recommendation rate was 89.6% ($n = 571$) among those experiencing suicidal ideation. Considering users not experiencing suicidal ideation, 64.6% ($n = 1{,}385$) reported the service helped them "well" or "very well," while 87.9% ($n = 1{,}878$) indicated that they would recommend the service to others. As such, there were no significant differences in satisfaction with the service, $U = 680781.00$, $p = 0.87$, nor regarding the probability of recommending the service to others, $U = 662483.50$, $p = 0.27$, between users experiencing and those that did not experience suicidal ideation.

TABLE 1 | Sociodemographic data and utilization characteristics.

Variable		Suicidal ideation	No suicidal ideation	X^2	ϕ, ϕ_c
Gender, *n (%)*				6.41*	0.03
	Female	1,065 (84.4%)	3,923 (71.1%)		
	Male	166 (13.2%)	715 (13.0%)		
	Diverse	31 (2.5%)	78 (1.4%)		
Age groups, *n (%)*				8.80*	0.04
	7–13 yrs.	250 (17.3%)	1,082 (19.6%)		
	14–17 yrs.	745 (51.6%)	2,612 (47.3%)		
	18–25 yrs.	449 (31.1%)	1,824 (33.1%)		
Prior use of professional help services, *n (%)*		320 (62.0%)	877 (15.9%)	23.77***	0.10
Current treatment or intervention, *n (%)*		543 (37.6%)	897 (16.3%)	317.94***	0.21
Time of first contact, *n (%)*				4.85	
	4 a.m.-8 a.m.	56 (3.9%)	225 (4.1%)		
	8 a.m.-12 p.m.	160 (11.1%)	623 (11.3%)		
	12 p.m.-4 p.m.	232 (16.1%)	1,005 (18.2%)		
	4 p.m.-8 p.m.	489 (33.9%)	1,802 (32.7%)		
	8 p.m.-12 a.m.	410 (28.4%)	1,553 (27.8%)		
	12 a.m.-4 a.m.	97 (6.7%)	329 (6.0%)		
				U	*r*
Likelihood of recommendation, *M (SD)*		8.55 (2.28)	8.40 (2.45)	662483.50	
	range	0–10	0–10		
User satisfaction, *M (SD)*		3.77 (1.07)	3.75 (1.11)	680781.00	
	range	1–5	1–5		
Mean session count per user, *M (SD)*		6.03 (9.35)	3.24 (4.97)	2974718.50***	0.18
	range	1–141			
Mean number of messages per session, *M (SD)*		28.7 (24.2)	22.68 (17.64)	3256016.50***	0.13
	range	3.25–337.00			
Mean word count per message, *M (SD)*	Chat user	15.07 (9.27)	17.46 (11.01)	3432471.00***	−0.10
	range	1.59–88.00			

*$p < 0.05$, ***$p < 0.001$; X^2, Chi-Square-Test-Statistic; ϕ, phi-coefficent; ϕ_c, Cramér's V; U, Mann-Whitney-U-Test-Statstic; r, Pearson correlation coefficient; percentages not adding up to 100% due to missing data.*

DISCUSSION

Principal Results and Comparison With Prior Work

The present study shows that adolescents *do* contact chat-based counseling services for support in case of suicidal ideation. We found that about one in five users that contacted *krisenchat* was reported to experience suicidal ideation. As such, it can be concluded that suicidality is a very present topic among children and young adults aged between 7 and 25 years, potentially even more in the ongoing pandemic situation. Users experiencing suicidal ideation attended significantly more sessions and wrote more but shorter messages when compared to users not experiencing suicidal ideation. Most importantly, user satisfaction, as well as the likelihood to recommend the service to others, were not significantly different between the two aforementioned groups.

In line with our previous analysis (34), a high satisfaction rate and a high likelihood to recommend the service to others of nearly 90% were found. These results indicate the high acceptability and feasibility of such online services. Further, they suggest the important role such online services may play in early prevention of suicidality (35). As of now, this potential seems to be at least partially untapped, as is indicated by the relative lack of such services in some countries like Germany.

According to previous research, users who seek help online due to suicidal ideation are more likely to be female, tend to use helplines later in the day or at night, and spend more time on the phone (17, 27). The average user affected by suicidal ideation identified in this analysis show consistent characteristics as described in previous literature. Furthermore, we found that roughly 21% of users contacting *krisenchat* reported suicidal ideation. Similarly, *Crisis Text Line*, a U.S.-based counseling service, reports (at the time of writing) that around 20% of users report suicidal thoughts (36). Sindahl et al. (35) report that 7% of users contacting *BørneTelefonen*, a Danish national child helpline, contact the service because of suicidal ideation. While the difference between the *BørneTelefonen* sample and the present sample regarding the proportion of users reporting suicidal ideation might be due to Sindahl et al. (35) analyzing a sample of SMS-based counseling sessions, a definite conclusion cannot be drawn from the available data.

Present results indicate that users experiencing suicidal ideation take part in more chat counseling sessions with significantly more messages with fewer words than non-suicidal users, i.e., they tend to write many short messages during a chat session. A reason for this finding could be that suicidal users of helplines are significantly more likely to reconnect with the helpline than non-suicidal users (37, 38). Another reason for the identified messaging pattern may be motivated by the counselor. Especially if they suspect a user to be at-risk for suicidal behavior, counselors may ask clarifying questions to assess the users' situation, which may prompt short answers such as "yes" or "no." Previous findings also show that adolescents who are not thriving prefer texting significantly more than their peers, because for some typing is easier than verbally expressing serious concerns (29, 39). Further, helplines should be aware of their function as a potential emotion regulator, which may hinder seeking more effective help, e.g., offline professional help services (35, 37). It also raises the question whether these users demand more of the counselors' capacity because of their high frequent use, as previous studies on telephone helplines have indicated in the past (40, 41).

The identified significant associations between suicidal ideation and NSSI, the affectedness by more than one concern, the current or past use of professional help services were significant but small. Regarding the further literature, suicidality and NSSI are known to be strongly related (42), and in some cases NSSI is a risk behavior for suicidality (10). Other findings also add bullying victimization, loneliness, and problems with parents as important risk factors for suicidal ideation (35). Chat helplines can bridge the gap of perceived lack of parental or social support (39).

However, not all adolescents affected by suicidality are seeking help nor using low-threshold, anonymous helplines. While the data show that every fifth user of *krisenchat* turns to the counseling service because of suicidal ideation, almost 40% never had had contact with the health care system before. Access to primary care for young people, especially for suicide prevention or crisis intervention, remains problematic and needs to be improved. Further, nearly 13% of the users who contacted *krisenchat* because of suicidal ideation were male. This may be explained by the general reluctance of boys or men to seek help (43), which is evident in the underrepresentation of boys and men in suicide or general helplines (44–46). Thus, reaching out to the male population regarding their mental health and supporting them in seeking help remains an open concern. Furthermore, it becomes clear that 2.5% of all *krisenchat* users identify themselves as gender diverse, but suicidality is a concern of nearly 30% within the users of the LGTBQIA+ community. Previous investigations found that persons from the LGTBQIA+ community seek out specialized LGTBQIA+ helplines and are less likely to utilize general helplines. This indicates that in addition to general help-seeking barriers, there may be systematic barriers in engaging youth from culturally or gender diverse backgrounds, e.g., because of the fear of shame and stigma (47).

On the part of the providers, there are several variables that may also influence the counseling process. For example, reduced stigma toward depression and literacy about suicidality are associated with confidence in exploring suicidality or risk-factors associated with suicidality (48). However, chat-based counseling, in addition to the numerous advantages, also brings with it some barriers. For example, risk assessment standards are needed for chat communication due to missing informative verbal and mimic cues (29, 49). Additionally, the lack of non-verbal cues aggravates for counselors to establish and maintain a therapeutic relationship, which is known as one of the key factors and of great influence in face-to-face mental health services and its outcomes (50, 51). Also, in some studies, counselors reported higher difficulties and a decreased ability to establish a therapeutic relationship in the digital environment (51, 52). As may be expected for a relatively new counseling setting, research exploring potential barriers and drawbacks of chat counseling is still lacking.

Strengths and Limitations

The present study is the first study to examine the utilization behavior and satisfaction with a chat-based crisis counseling service in German speaking children, teenagers, and young adults reporting suicidality using real world data. However, several limitations need to be taken into account. As we employed a retrospective study design, the present study relied on convenience sampling. As such, the resulting sample is not representative of the general population. Furthermore, no standardized measurement instruments were employed and the present study did not supply follow-up data. Such longitudinal data would be of great use to gauge the success and effectiveness of *krisenchat* regarding, e.g., successful referrals to professional mental health services or the alleviation of suicidal ideation.

CONCLUSION

As the results of the present study show, the high level of satisfaction with the low-threshold messenger-based chat counseling service that was previously found for a general sample of users (34) also extends to users experiencing suicidal ideation. Therefore, it may be concluded that young people use the internet to access anonymous chatting, help-seeking, and crisis intervention services for serious concerns like suicidality. Expanding on this, our results imply that users use the services of *krisenchat* during all hours of the day (and night). As such, existing telephone-based counseling services may want to consider expanding their services to messenger and internet-based modalities and to all hours of the day to reduce barriers and facilitate access to their services, while political stakeholders should ensure that resources are provided for the creation of new and the expansion of already existing services. While the present and previous studies show that users of messenger-based crisis intervention services are highly satisfied with the services, further research (in particular longitudinal studies) is needed to explore the effectiveness of such services regarding the prevention of suicides and other outcomes of interest. Moreover, longitudinal studies may help to investigate the underlying processes of successful suicide prevention interventions using messenger and chat services, as well as to identify modifiable protective factors.

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 University Leipzig, Medical Faculty. 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

EK, LG, and CR-K designed the study. ZE, LG, and SB performed the statistical analysis. EK and LG drafted the article. SS, JT, and RW prepared the data set and edited previous versions of the manuscript. ME, ZE, SB, EK, KK, and CR-K discussed the results and contributed to the final manuscript. All authors have approved the final manuscript.

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The Association of Abuse and Depression With Suicidal Ideation in Chinese Adolescents: A Network Analysis

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Background: Abuse experiences in adolescents are associated with the risk of depression and suicide. Thus, there is an urgent need to develop prevention and intervention measures for clinicians, policymakers, and researchers.

Methods: Network analysis method was used to analyze the cross-sectional data of Chinese adolescents in this study. The Patient Health Questionnaire for Adolescents (PHQ-A) was used for assessing depression, in which item 9 of the PHQ-A was used to assess suicide ideation, and International Society for the Prevention of Child Abuse and Neglect (ISPCAN) Child Abuse Screening Tool-Children's Home Version (ICAST-CH) was used for assessing abuse.

Results: The prevalence of suicidal ideation among Chinese adolescents was 21.46% (95% CI, 20.79–22.16%). The prevalence of moderate or severe depression was 16.76%, and the prevalence of violence exposure, psychological victimization, neglect, and physical victimization was 33.5%, 59.5%, 28.37%, and 31.51% in the past years, respectively. Network analysis results showed that the most central nodes in the network of abuse and depression were "unimportant," "not cared," and "pushed." The bridge nodes were "suicidal ideation" and "unimportant." The nodes "sadness," "failure," and "unimportant" explained the largest proportion of the variance of suicidal ideation in our network. Differences were found in the structure of both abuse and depression networks between adolescents with or without suicidal ideation.

Limitations: The self-reporting–based cross-sectional surveys and community sample groups limit the inference of causality and the generalization of the results.

Conclusion: This study shows that "unimportant" is the central and bridge nodes in the abuse and depression networks and also explains a part of variance of suicidal ideation. The effect of "unimportant" should be considered in the prevention and intervention of depression and suicide in adolescents with abuse experience. Future study is needed to confirm its role in clinical intervention.

Keywords: adolescents, depression, child abuse, suicide ideation, network analysis

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INTRODUCTION

Over 264 million people of different ages suffer from depression globally, which is a leading cause of disability and a major contributor to the global burden of disease (1). Depressive symptoms include changes in moods and psychological behaviors (2), and major depression can contribute to the development of suicidality or affect social functions (3, 4). Depression typically starts in childhood or adolescence, and its prevalence significantly increases in adolescence and slows down and stabilizes till the end of adolescence (5, 6). However, its recurrence rate is high in adulthood (7, 8). Many patients with depression do not receive effective treatment; previous research reported that only 19.5% of patients with major depression receive treatment in China (9). As the main depressive symptoms of adolescents may be quite different from those of adults (7), it is necessary to explore the characteristics of depressive symptoms of adolescents to guide early detection and intervention.

One major risk factor of depression is the experience of abuse, which widely exists in people of all ages, ranging from children to the elderly (10, 11). Compared with adults, there is a higher rate of abuse among children, while they are less resilient to it. Although the rate of child abuse in China decreased from 70.1% (12) in 2010 to 42.3–62.7% in 2019 (13), it is still much higher than that in Western developed countries (23.5–37.4%) (14, 15). Child abuse will not only lead to physical injury but also cause serious psychological trauma and even affect the mental health in adulthood (13, 16). It is reported that childhood abuse is a common cause of depression (17–19) and even increases the risk of depression and anxiety in adulthood (20).

The previous study reported that parents are responsible for 81% of child abuse, among whom 88% are biological parents (21), which means that family is the primary place where child abuse occurs. This phenomenon may be accounted by the strict education (the so-called "education through stick and club") that is prevalent in China, which means that children will be punished if they are considered not behaving themselves, such as failure in examination, offending guardians, and not being obedient. A previous study has shown that frequent exposure to family abuse is an independent risk factor for depression in adulthood (22). Therefore, research on child abuse in families is helpful and necessary to understand the development of depressive symptoms. Emotional abuse and neglect in children are usually a risk factor of early onset of depression (23). Therefore, the effect of parental psychological abuse on children should be addressed to reduce the risk of depression in adolescents (24). In addition, abuse experience also affects the recovery from depression. Research shows that, during 12 months, the recovery rate of severely depressed women without abuse experience is 3.7 times higher than that of those with abuse experience (25).

Suicide is the second leading cause of death among adolescents (26), and the development of suicidality may be the most serious consequence of depression. The factors contributing to adolescent suicide include psychological factors (such as depression and anxiety), stressful life events (such as family problems and peer conflicts), and personality traits (27). The relationship of depression and anxiety symptoms with suicidal ideation has been explored in our previous study (28). However, depression and anxiety cannot fully explain suicidal ideation; other suicide risk factors are equally important, such as child abuse, which is reported to be directly associated with suicide. A total of 80% of people who attempt suicide have a history of child abuse (29), and abuse increases the risk of suicidal ideation and suicidality (30). A study in Hong Kong, China, shows that child abuse is an important risk factor for attempted suicide, 4.1% of children are hospitalized because of attempted suicide within 5 years after abuse, and the rate of suicide attempt rises to 7.1% within 20 years (31). This evidence shows that child abuse is an important risk factor for suicide. It is necessary to further investigate which type of abuse events has a direct effect on suicide to provide guidance for reducing the risk of suicide.

Network analysis provides a new perspective to understand the relationship between symptoms of psychological disorders and other variables of interest. Many previous studies have explored the relationship between depressive symptoms and other variables through network analysis, such as PTSD (32, 33), eating disorders (34), and negative life events (35). In addition, studies have explored the relationship between depressive symptoms and suicidal ideation (36). These studies provide insights into the relationship between depressive symptoms and suicidal ideation. However, so far, network analysis has not yet been conducted to investigate the relationship between abuse, depression, and suicidal ideation. Therefore, this study adopts network analysis to explore the network structure of all items of Patient Health Questionnaire for Adolescents (PHQ-A) and International Society for the Prevention of Child Abuse and Neglect (ISPCAN) Child Abuse Screening Tool-Children's Home Version (ICAST-CH) in a large sample (n = 13754) of Chinese adolescents, as well as the relationship of abuse events and depressive symptoms with suicidal ideation. It also compares the differences in network structures between adolescents with or without suicidal ideation. The present study aims to identify the association between abuse events and depressive symptoms in adolescents, the potential targets for abuse and depression interventions and different targets of intervention between adolescents with or without suicidal ideation, so as to alleviate depression and reduce suicide risk.

MATERIALS AND METHODS

Ethics Statement

This study has been reviewed and approved by the Medical Ethics Committee of the Department of Medical Psychology, Army Medical University (No. CWS20J007). The written approval was obtained from the officials of the sampled schools. The parents or legal guardians provided consent to participate in the study on behalf of the children. Participants read the informed consent before participating in this study and were reminded that the survey was anonymous and personal information would not be disclosed.

Participants

This was a cross-sectional cluster sample survey that was conducted between October and November in 2020, which

investigated 18,133 students from 32 schools in Chongqing, China, ranging from the third grade of primary school to the third grade of secondary school. By excluding 3,854 questionnaires of those younger than 11 and older than 17 years old and 525 ones with redundant choices or completion rates lower than 50%, we included the remaining 13,754 valid questionnaires in the final analysis (response rate, 75.85%). Data analysis was performed from March 2021 to June 2021. The sample flow diagram is shown in **Figure 1**.

Measures

Symptoms of Depression

The depressive symptoms of adolescents were assessed by PHQ-A, which is the most commonly used screening tool for depressive symptoms (37). It includes nine items, such as "little interest or pleasure in doing things" and "feeling down, depressed, or hopeless." The participants were asked to choose the frequency of each symptom in the last 2 weeks. The score of each item ranged from 0 ("not at all") to 3 ("nearly every day"). The higher the total score is, the more severe the depression would be. The Cronbach's α of PHQ-A in the current study was 0.893.

Suicide Ideation

Item 9 of the PHQ-A was used to assess suicide ideation: "thoughts that you would be better off dead, or of hurting yourself in some way?" The item is rated on a four-point scale: 0 = not at all; 1 = several days; 2 = more than half the days; and 3 = nearly every day. Adolescents who scored ≥ 1 were considered to meet the criteria for suicide ideation.

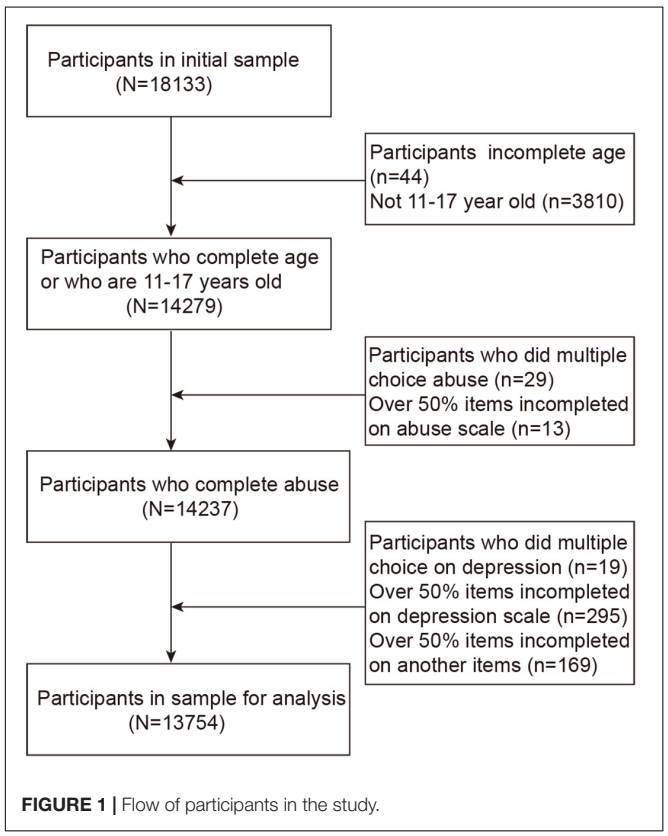

FIGURE 1 | Flow of participants in the study.

Events of Child Abuse in Families

Child abuse screening tool-children's home was used to assess the abuse experience of the adolescents in the last year (38). The tool contains 36 items with five dimensions: violence exposure (seven items), emotional abuse (eight items), neglect (six items), physical abuse (nine items), and sexual abuse (six items). Because sexual abuse survey failed to pass the ethical review, it was excluded in the current study. The final survey included the remaining 30 items. Participants were asked to score each item (0–6 points) according to their experience in the last year (0: never happened, 1: happened but not in the last year, 2: one to two times, 3: three to five times, 4: six to 12 times, 5: 13 to 50 times, and 6: more than 50 times). Score 0 represents the absence of abuse and score 1–6 abuse of various levels. The total score ranges from 0 to 180. A high score indicates a high frequency of abuse or more types of abuse. Cronbach's α of the scale was 0.904 in the current study.

Data Analysis

Data Preparation

The data were imported into the Excel to exclude the questionnaires with redundant choices, and those with a response rate of less than 50% were also excluded. We imputed the remaining data using the mice package in R 4.0.0. The potential redundant nodes in the network were identified using the "goldbrick" function of the R *networktools* package. As a result, none of the items were suggested to be excluded in further analysis.

Graphical Least Absolute Shrinkage and Selection Operator Network

A network was constructed to explore the relationship between abuse events and depressive symptoms. The EBICglasso function of the R *qgraph* package was used to estimate the network (39). Graphical Least Absolute Shrinkage and Selection Operator (LASSO) algorithm was performed for regularization of Gaussian graphical model (GGM), which can shrink all edges and set the edges with small partial correlation to zero to obtain a more stable and easier to interpret network. The GGM is undirected, with its edges representing the partial correlation between the nodes in the network. In the visual network, the red edge represents the negative correlation between nodes, whereas the blue edge represents the positive correlation between nodes. A thicker edge indicates a stronger link between nodes.

Network Centrality, Predictability, and Robustness

The expected influence centrality index was calculated by the R *qgraph* package (40). A previous study has shown that expected influence is more appropriate for the network with both negative and positive edges when compared with the traditional node centrality index (e.g., strength centrality) (41). Thus, we chose expected influence as the centrality index in the current study. Expected influence is the sum of the value (e.g., correlation coefficients) of all edges connecting to a given node. The greater the expected influence of the node is, the more important it would

be in the network. Moreover, we computed the predictability for each node *via* R *mgm* package (42). Predictability means the extent to which the variance of a node can be explained by all of its adjacent nodes.

The stability and accuracy of the network were calculated by the R *bootnet* package (43). First, the bootstrap approach (nBoots = 2,000) was used to evaluate the accuracy of edge weights *via* computing the 95% CI. The narrower the CI was, the more accurate the estimation of edge weight would be. Second, the case-dropping bootstrap method was used to evaluate the stability of the centrality index *via* calculating the correlation stability coefficient. The correlation stability coefficient should not be lower than 0.25, preferably higher than 0.50 (43).

Bridge Nodes

To identify important nodes that bridge the abuse-depression connection, we calculated the bridge expected influence (i.e., the sum of edge weights from a given node to the other community) *via* the R *networktools* package (44). From the perspective of statistics, nodes with higher bridge expected influence in one community have wider and closer connections with nodes in the other community. Thus, nodes with higher bridge expected influence are considered to play more central roles in activating nodes from the opposite community. In this study, all nodes were divided into two communities: one community contained 30 abuse events and the other one contained nine depressive symptoms.

Flow Network Analysis of Suicide Ideation

The "flow" function of the R *qgraph* package was used to layout the nodes directly or indirectly correlated to suicidal ideation. This layout placed "suicide ideation" on the left side as the target variable and constructed a horizontal network. Nodes in the network were directly or indirectly correlated with suicidal ideation by edges.

Network Comparison of Suicide Ideation

Finally, we used the *NetworkComparisonTest* package to compare whether differences existed in network structure and overall network connectivity between adolescents with or without suicidal ideation (permutations = 2,000) (45). We analyzed the global strength value and p-value of each network and the differences in network structure and the number of edges with significant differences.

RESULTS

Descriptive Statistics

The sample used in this study consisted of 13,754 adolescents, aged from 11 to 17 years (M = 13.57, SD = 1.86). Of them, 6,806 were boys (49.48%), 6,880 were girls (50.02%), and 68 did not select a gender. The mean score of depression was 5.08 (SD = 5.30), and 16.76% of the participants had moderate or severe depressive disorder (see **Table 1**). The mean score of abuse was 24.30 (SD = 27.39), and 67.78% of the participants were abused at least once in the past year, whereas 85.55% were abused at least once in their lifetime, with psychological abuse being the most frequent (see **Table 1**). Abuse experiences were significantly associated with depression (**Supplementary Table 1**). **Tables 2**, **3** show the average, SD, and prevalence of the symptom and predictability of each item. Depression symptoms "anhedonia" and "fatigue" were the most frequent symptoms. Among the abuse events, "screaming" had the highest frequency, whereas "burned" had the lowest frequency. A total of 21.46% (95% CI, 20.79–22.16%) participants (n = 2,952) had suicidal ideation.

Network Structure

The networks of depression and abuse events are shown in **Figure 2**. Of the 741 edges with possible connections, 428 were not zero. We found several closely connected edges in the network. The most closely linked edges between abuse events are A11 (death wish)–A12 (abandon) (weight = 0.32), A18 (not care)–A19 (unimportant) (weight = 0.32), A23 (hit with hand)–A24 (hit with object) (weight = 0.30), A9 (induced)–A10 (embarrassed) (weight = 0.29), and A3 (hit, kick, slap)–A4 (weapons) (weight = 0.29). The most closely linked edges in depressive symptoms were D3 (sleeping)–D4 (appetite) (weight = 0.22) and D1 (safety)–D6 (failure) (weight = 0.21). Predictability is shown in **Figure 2** through a ring around the nodes. The predictability of all nodes ranged from 0.1 to 0.61.

Stability and Centrality of Network

Considering that the current network had 13,754 participants and the bootstrapped 95% CI was relatively narrow, the estimation of the edge weight was accurate (**Figure 3**). The coefficient of stability of the expected influence centrality index of the network was 0.75, higher than the recommended critical value of 0.25 (43).

TABLE 1 | Demographics, depressive severity and abuse rate of the participants (n = 13754).

	M (S.D.)/*n* (%)	
Age	13.57 (*1.86*)	
Gender		
Male	6806 (49.48)	
Female	6880 (50.02)	
Missed	68 (0.50)	
Depression Severity (Total raw score)		
0–4	7,904 (54.47)	
5–9	3,545 (25.77)	
10–14	1,344 (9.77)	
15–19	613 (4.46)	
20–27	113 (2.53)	
Prevalence of abuse in past year and lifetime	**Past year**	**Lifetime**
Violence exposure	4,608 (33.50)	8,637 (62.80)
Psychological victimization	8,184 (59.50)	10,576 (76.89)
Neglect	3,902 (28.37)	5,518 (40.12)
Physical victimization	4,334 (31.51)	8,814 (64.08)
Any abuse	9,322 (67.78)	11,767 (85.55)

The SD in italics to distinguish them from %s in the other brackets.

TABLE 2 | Abbreviation, Mean, Standard Deviation, and Presence of PHQ-A Symptoms.

Depression symptoms	Abbreviation	Mean	SD	%Presence	Predictability
Feeling down, depressed, irritable, or hopeless	D1: Sadness	0.610	0.770	46.82	0.538
Little interest or pleasure in doing things	D2: Anhedonia	0.706	0.817	52.44	0.431
Trouble falling asleep, staying asleep, or sleeping too much	D3: Sleeping	0.570	0.854	38.44	0.467
Poor appetite, weight loss, or overeating	D4: Appetite	0.424	0.748	30.21	0.371
Feeling tired, or having little energy	D5: Fatigue	0.743	0.867	52.46	0.482
Feeling bad about yourself, or that you're a failure or that you've let yourself or your family down	D6: Failure	0.748	0.918	49.73	0.548
Trouble concentrating on things like school work, reading, or watching TV	D7: Concentration	0.675	0.889	45.45	0.438
Moving or speaking so slowly that other people could notice	D8: Motor	0.294	0.637	21.74	0.409
Thinking that you would be better off dead, or of hurting yourself in some way	D9: Suicidality ideation	0.309	0.679	21.46	0.475

D1-D9 are PHQ-A items on depression. SD: Standard Deviation.

TABLE 3 | Abbreviation, Mean, Standard Deviation, and Presence of ICAST-CH abuse Events.

Abuse events	Abbreviation	Mean	SD	%Presence	Predictability
Frightened by adults' using drugs	A1: Drug	0.500	1.130	23.39	0.207
Adults shouting in frightening way	A2: Shouting	0.954	1.293	49.35	0.368
Witnessing adults in home hitting, kicking, slapping	A3: Hit, kick, slap	0.347	0.816	21.27	0.378
Witnessing adults in home using weapons	A4: Weapons	0.134	0.537	8.36	0.319
Someone close got killed near home	A5: Killing	0.036	0.274	2.55	0.200
Having seen people being shot or rioting	A6: Shotting	0.113	0.478	7.37	0.174
Something stolen from home	A7: Stealing	0.219	0.570	16.91	0.102
Screaming	A8: Screaming	1.705	1.845	62.63	0.447
Insulted	A9: Insulted	1.430	1.924	48.6	0.393
Feeling embarrassed	A10: Embarrassed	1.169	1.561	48.16	0.459
Wished you were dead	A11: Death wish	0.514	1.142	23.48	0.520
Threatened to abandon	A12: Abandon	0.351	0.940	17.37	0.479
Locked out of home	A13: Locked out	0.279	0.697	18.82	0.311
Bullied by another child at home	A14: Bully	0.511	1.146	23.7	0.232
Being hungry or thirsty	A15: Hungry	0.070	0.421	3.8	0.260
Inadequate clothing	A16: Clothes	0.115	0.595	4.96	0.197
Unmet medical need	A17: Medical need	0.163	0.646	8.08	0.328
Feeling not cared for	A18: Not cared	0.404	1.070	17.13	0.533
Feeling unimportant	A19: Unimportant	0.675	1.398	26.08	0.608
Inadequate support/help	A20: Helpless	0.752	1.443	29.32	0.447
Threatened to hurt or kill you	A21: Hurt or kill	0.114	0.567	5.66	0.286
Pushed, grabbed, kicked	A22: Pushed	0.603	1.120	31.98	0.511
Hit, beat, spanked with hand	A23: Hit with hand	0.854	1.204	47.67	0.476
Hit, beat, spanked with object	A24: Hit with object	0.734	1.084	44.84	0.496
Trying to choke, smother, or drown	A25: Choke	0.066	0.389	3.99	0.267
Burned or scalded	A26: Burned	0.019	0.203	1.23	0.288
Locked in small place	A27: Locked	0.086	0.449	5.18	0.236
Pulled hair, pinched, twisted ear	A28: Hair pulling	0.562	1.086	30.12	0.478
Holding heavy load as punishment	A29: Heavy load	0.167	0.646	9.02	0.194
Threatened with a knife or stick	A30: Knife threat	0.100	0.494	5.75	0.301

A1-A30 are items on abuse. SD, Standard Deviation.

The expected influence of depression and abuse networks is shown in **Figure 4A**. Abuse events "unimportant," "not cared," and "pushed" have the highest expected influence, suggesting that these three nodes have the strongest connection with other nodes in the network. Abuse events "stealing" and "killing" have the lowest expected influence in the current research, indicating that they have the weakest connection with other nodes and are the least influential in the network from the perspective of statistics.

Bridge Nodes

The results regarding bridge nodes show that the depressive symptom "suicide ideation" and abuse event "unimportant"

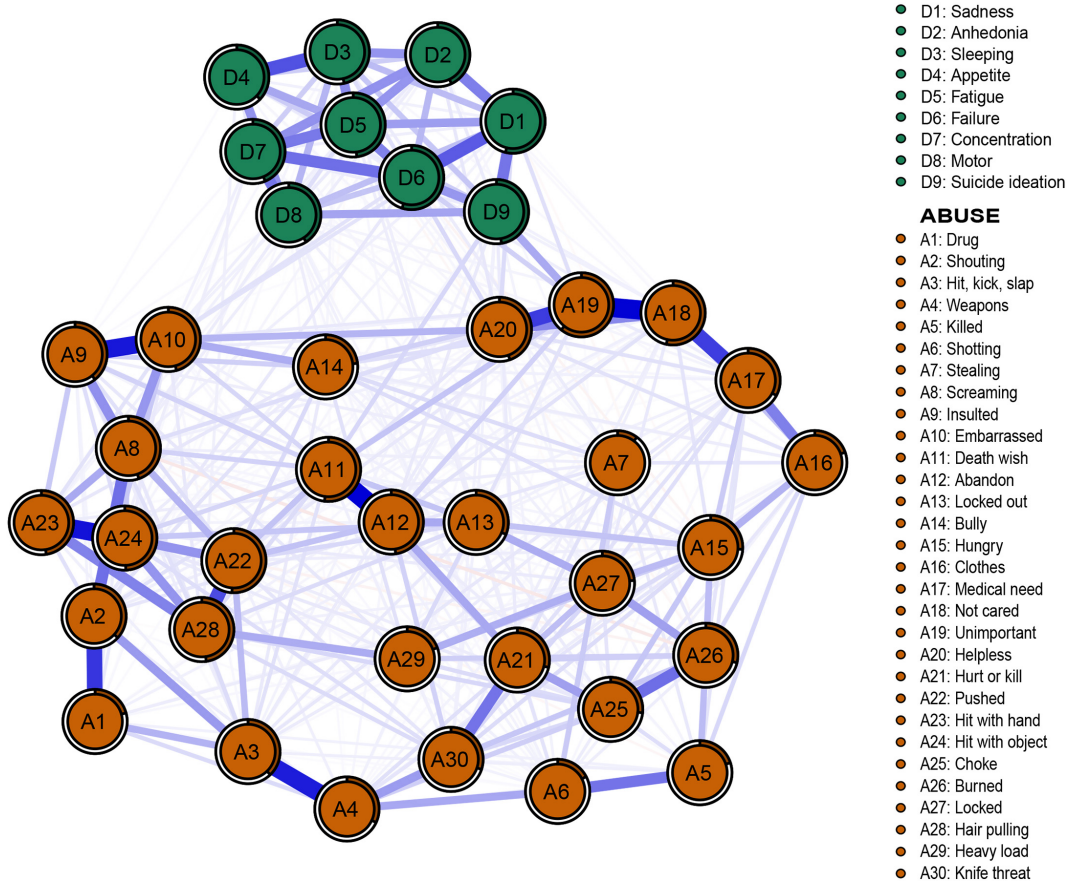

FIGURE 2 | Network structure of abuse events and depression symptoms in adolescents.

have the highest bridge expected influence, indicating these two variables have wider and closer connections with nodes in opposite community. Thus, abuse event "unimportant" may play more central roles in activating depressive symptoms (**Figure 4B**). The stability coefficient of the bridge expected influence was 0.44, which means that the stability of the bridge expected influence is acceptable.

Flow Network of Suicide Ideation

To further explore the effect of abuse events and depressive symptoms on suicidal ideation, the flow network was constructed to reveal the association between "suicide ideation" and other nodes (**Figure 5**). The results showed that 20 nodes in the network were directly connected with "suicide ideation," and 18 nodes were indirectly connected with "suicide ideation." In addition to the depressive symptoms "safety" and "failure," abuse event "unimportant" is strongly connected to suicidal ideation. In addition, through the predictability index, adjacent nodes can explain 47.5% of the variance of "suicide ideation."

Network Comparison of Suicide Ideation

Significant differences existed in the network structure of abuse events and depressive symptoms between adolescents with or without suicidal ideation, but no significant difference was found in global strength between them [network structure (M) = 0.19, $p = 0.01$; global strength (S) = 0.47, no suicidal ideation = 16.83, suicidal ideation = 17.30, $p = 0.44$]. This means that differences exist in the interaction between nodes but not in the overall connectivity of nodes in the network. There may be differences in central nodes between adolescents with or without suicidal ideation. We further analyzed the network structure of the two groups, finding that the central nodes of those with suicidal ideation were "unimportant" and "abandon," whereas those without suicidal ideation were "pushed" and "unimportant." The number of edges with significant differences in the two networks was 56, indicating that there were many different paths in the two networks.

DISCUSSION

We studied the prevalence of abuse and depression among children and adolescents in China, and the results show that the prevalence of child abuse in China is very high, especially psychological abuse. The prevalence rate is comparable with that of other regions or countries using the same tools, such as

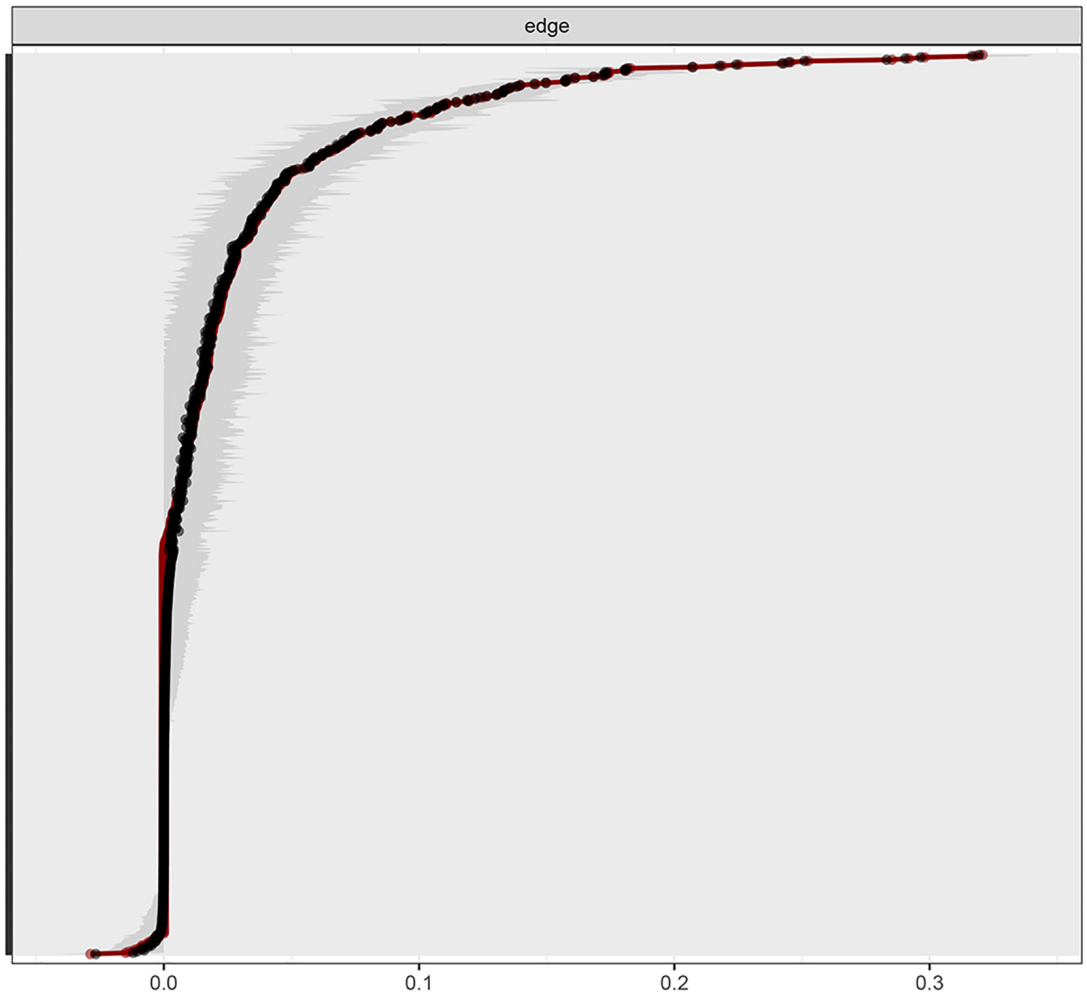

FIGURE 3 | Non-parametric bootstrapped CIs of estimated edges for abuse events and depression symptoms.

Taiwan (lifetime prevalence rate of 91% and 1-year prevalence rate of 83%) (46), India (1-year prevalence rate of 89.9%) (47), and Bangladesh (lifetime prevalence of neglect 78% to lifetime psychological abuse 97%) (48). However, the prevalence is slightly higher than that of the nine countries in the Balkan region (e.g., psychological abuse prevalence of 83.2% in Greece) (49, 50). Furthermore, the prevalence rate is higher than that measured with other tools (such as Childhood Trauma Questionnaire, according to which psychological abuse prevalence was 48.1%) (51). Therefore, future work should be focused on laying down unified criteria to facilitate the comparison of results. We also found that the prevalence of depression was also higher than previously reported in the United States (8.7–11.3%) (52) and lower than that in Ethiopia (28%) (53) and India (25%) (54). Research shows that adolescents in Confucian countries in Asia have higher levels of depression than those in European countries (55), which may be explained by a higher prevalence of abuse. Indeed, the current results show that abuses of all types are significantly positively correlated with depression. Relevant prevention policies should be formulated to reduce the prevalence of abuse in Asian countries.

The current study analyzed the characteristics of abuse event and depression networks of Chinese community adolescents. The score of each item in the questionnaire showed that depression symptoms "anhedonia" and "fatigue" and abuse event "screaming" are the most frequent symptoms. Among depressive symptoms, "fatigue" is the most frequent symptom, consistent with the study by Rice et al.; however, according to them, "anhedonia" is the most frequent depressive symptom in adults, not in adolescents (7). The difference might be explained by the fact that the samples in their study were patients with major depression, whereas those in our study were taken from community. However, common symptom also exists between these two kinds of samples, such as "fatigue." Therefore, the differences and similarities between samples should be considered in adopting prevention and

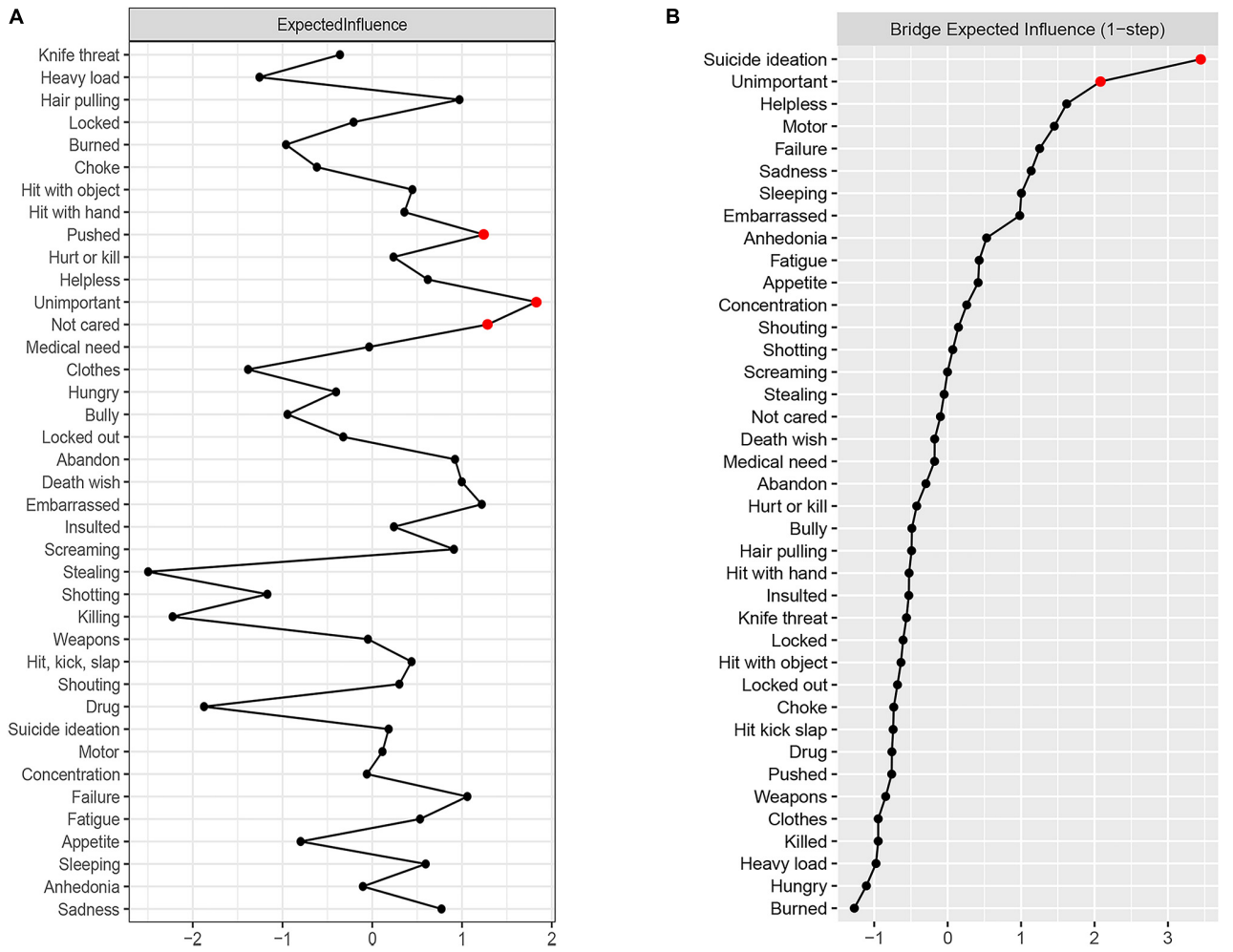

FIGURE 4 | Centrality plot of the expected influence **(A)** and bridge expected influence **(B)** of abuse events and depression symptoms in the network (z-score).

intervention measures. Among abuse events, "screaming" is the most frequent. Compared with physical abuse, verbal abuse is often underestimated. In Chinese traditional culture, shouting at children is not considered as a form of child abuse (56) but as a common way of parenting (57). Research shows that parents who suffer from verbal abuse themselves are more likely to use it against their children (58), which may explain the high frequency of verbal abuse. Therefore, education of parents is an effective way to reduce the verbal abuse. Finally, it is worth noting that the rate of "suicide ideation" in the current sample is 21.46%, much higher than that reported in other studies (12%) (36). Although the suicide rate of teenagers has gradually decreased in the past 20 years, suicidal ideation is still widespread (59), which needs further exploration.

The expected influence index of the network shows that "unimportant" is the most central node in the network of abuse events and depressive symptoms. Taking the central node as a potential target for intervention might prevent the activating and maintaining of the network of abuse events and depressive symptoms. Therefore, the intervention against "unimportant" may hopefully reduce childhood abuse and alleviate depressive symptoms among Chinese adolescents. "Unimportant" is a type of neglect, the prevalence of which varies between different cultures, which is 12.5% in India (47), 37.9% in Saudi Arabia (60), and 26.08% in the current sample, indicating that it is a common phenomenon among teenagers. In addition, the high predictability of "unimportant" (0.61) means that 61% of the variance can be explained by adjacent nodes. The nodes "not cared" and "helpless," both belonging to neglect, have the strongest direct connection with "unimportant," suggesting that lack of care is a serious problem among Chinese teenagers. Indeed, in China, both parents of most families need to work to support the family. In particular, some parents need to go out to work for a long time; therefore, they cannot spare enough time for taking care of their children and attending to their emotional need, leading to the development of emotional neglect symptoms of the children.

In addition, we found some edges with strong links, which exist within each community, rather than between the communities, similar to the results of previous research (28,

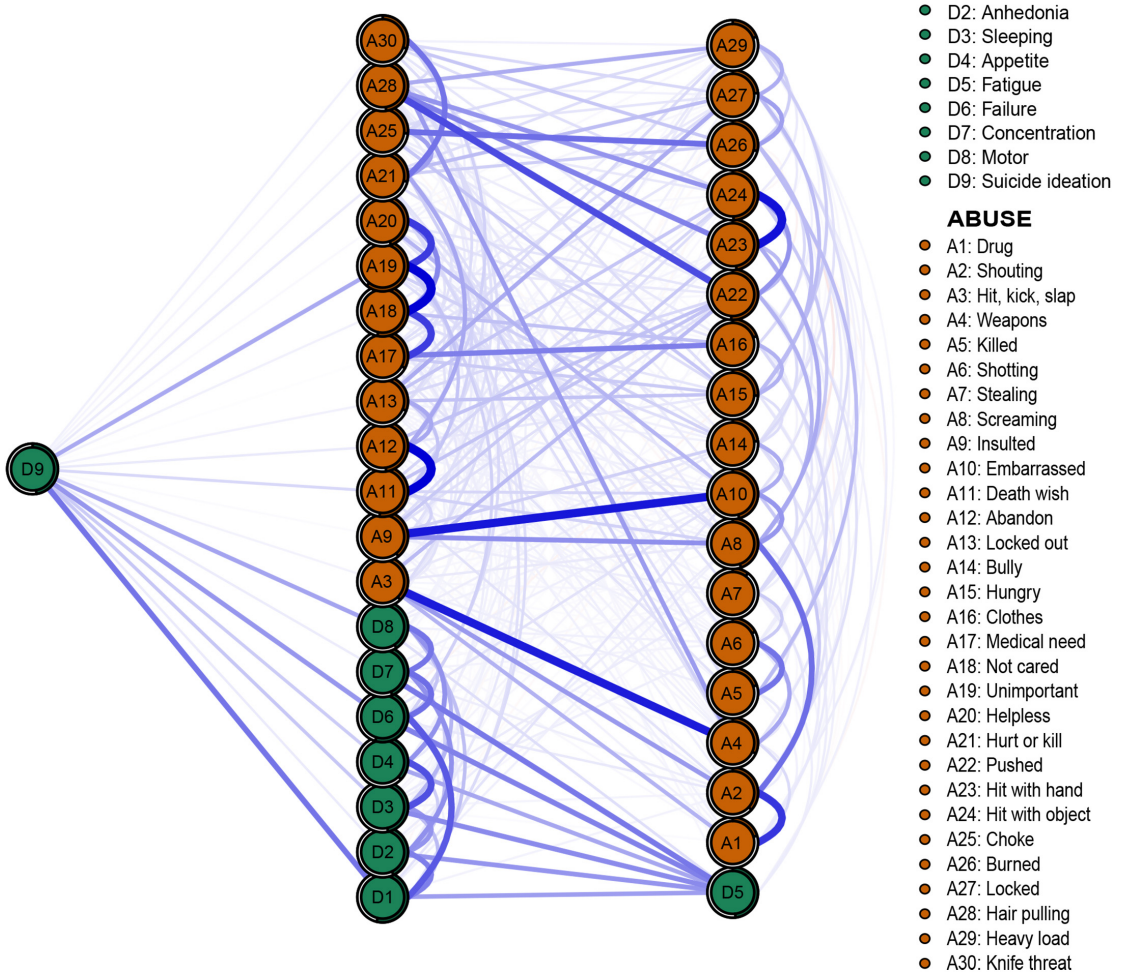

FIGURE 5 | Flow network of suicide ideation.

35, 61–64). The edges with strong links in the community of abuse events include death wish–abandon (weight = 0.32), not cared–unimportant (weight = 0.32), and hit with hand–hit with object (weight = 0.30). The strongest links in the community of depressive symptoms were sleeping–appetite (weight = 0.22) and safety–failure (weight = 0.21). Although the strongest edges do not exist across two communities, we found a very important edge between abuse events and depressive symptoms: "unimportant"–"suicide ideation" (weight = 0.11). In the current network, the edge with the strongest link in the depressive symptoms is different from that in the previous study on depression network, which found that the edges with strong links were "sad mood"–"anhedonia" or "energy"–"fatigue" (61, 62). However, our results are similar to those of Wasil et al. (65), who found that "sleep"–"appetite" is the most strongly linked edge among depressive symptoms. These differences may be explained by the fact that the first two studies adopted clinical samples (61, 62), whereas the current study and the study of Wasil et al. adopted community adolescents as samples (65). Sleep problems and weight changes are the main physical symptoms of depression in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (66), indicating that contagion of somatic symptoms may exist among community adolescents. The strongest link across two communities is "unimportant"–"suicide ideation," which has rarely been discussed in previous studies. "Unimportant" is a type of neglect. As it has been shown that emotional neglect is associated with an increased risk of suicidal ideation (67), and this association is regulated by depressive symptoms (68), we considered that "unimportant" may arouse feelings similar to the depressive symptom "worthless," resulting in "suicide ideation" (indirect pathways), which warrants further study in the future.

In addition, to explore the bridge nodes in the abuse event and depression symptom networks, we use the bridge expected influence as an observation index. Nodes with higher expected influence are considered to play more central roles in activating nodes from the opposite community. Thus, intervention against bridge nodes may prevent or reduce the activation from one

community to the other community. We found two bridge nodes in the current network: depression symptom "suicide ideation" and abuse event "unimportant." This indicates that intervention on "unimportant" may more effectively prevent or reduce the activation of depression symptoms.

The results of flow network show that there are 20 directly linked edges and 18 indirectly linked edges. Similar to the results of previous research (28, 36), all nodes in the network have a direct or indirect association with "suicide ideation," supporting that "suicide ideation" is a highly complex phenomenon (69). In the current network, 48% of the variance of "suicide ideation" can be explained by adjacent nodes. The nodes directly and strongly linked to "suicide ideation" are depression symptoms "sadness" and "failure" and abuse event "unimportant." The depressive symptoms directly associated with suicidal ideation are similar to those reported by previous studies (70), whereas the direct association between abuse event "unimportant" and suicidal ideation has not been explored previously. Previous studies show that neglect in early life can increase depression and anxiety symptoms and has a significant indirect effect on suicidal ideation (71, 72), and our results extend the finding by showing that certain types of neglect can also affect suicidal ideation directly. Our findings may provide more clues for suicide prevention and support the contribution of abuse to suicide risk. According to the three step-theory of suicide (73), suicidal ideation is the first step of suicide. Early intervention against "sadness," "failure," and "unimportant" may be significant in suicide prevention clinically.

Finally, we compare the differences between adolescents with or without suicidal ideation in the network of abuse events and depressive symptoms. We found significant differences in the network structure, rather than the global strength, suggesting that there are differences in the main symptoms and the interaction between the two groups with or without suicide ideation. The results showed that the central nodes in the network of those with suicidal ideation were "unimportant" and "abandon," whereas the central nodes of those without suicidal ideation were "pushed" and "unimportant." Therefore, "unimportant" is the most important node in the network of those with suicidal ideation, whereas its role is weakened in the network of those without suicidal ideation. This may further support that "unimportant" has an important effect on suicidal ideation. The above results might suggest different targets of intervention for adolescents with or without suicidal ideation. Therefore, it is important to clarify whether adolescents have suicidal ideation to adopt more effective intervention measures.

In summary, to reduce the prevalence of depression and suicidal ideation in adolescents, we can adopt the following measures: First, strengthening education of parents to reduce the prevalence of child and adolescent abuse. For example, the parents should be taught the appropriate parenting ways instead of abuse. Second, paying attention to the effect of neglect (e.g., abuse events "unimportant" and "not cared") on depression of children and adolescents. To attend to the children's emotional need, the parents need to spend more time with their children and engage in parent–child interaction (including communication) to improve parent–child relationship and alleviate depression as well as anxiety, which is highly comorbid with depression (74). Third, intervening against the depressive symptoms "sad mood," "failure," and abuse event "unimportant" to prevent suicidal ideation. For example, adolescents can be encouraged to participate in more physical activities, which is helpful to prevent and treat depression (75, 76). This is particularly important in China, where exam-oriented education is prevailing. Moreover, adopting targeted measures for adolescents with suicidal ideation. For example, schools can set up counseling rooms or initiate mental health activities, which can offer prevention and intervention measures for those with suicidal ideation. Studies have shown that conducting Empowering a Multimodal Pathway Toward Health Youth (EMPATHY) can effectively reduce suicidal ideation, depression and anxiety (77). The prevention of depression and suicide in children and adolescents needs policy support and the participation of more people concerned. It is necessary to develop a more comprehensive, safe, and effective long-term plan in the future.

LIMITATIONS

Similar to other network analysis, our research has some limitations. First, this is a cross-sectional survey, which can only make undirected network estimation, but not causal inference. Second, the data are taken from community samples, which may limit the translation of the results to clinical use. Third, because the data were collected from a single region in Chongqing of China, the results of this study may not be generalizable to the adolescents in other regions. Last, the data are based on participants' self-reports regarding specific problems; thus, the network structure may be affected by different measurement tools and time.

CONCLUSION

In conclusion, to our knowledge, this study investigates the network characteristics of abuse events and depressive symptoms of adolescents in China for the first time. The results showed that the prevalence of "suicidal ideation" among Chinese adolescents is high. The abuse events "unimportant," "not cared," and "pushed" have the highest expected influence centrality in the network. We also found that "suicidal ideation" and "unimportant" are the bridge nodes of the network. A total of 20 nodes including "sadness," "failure," and "unimportant" are directly connected with suicidal ideation. There are differences in network structure between adolescents with or without suicidal ideation. Further study is needed to verify the effectiveness of intervention against these variables in the future.

DATA AVAILABILITY STATEMENT

The data analyzed in this study is subject to the following licenses/restrictions: Involving private information, the data

may be available from the corresponding author for a reason. Requests to access these datasets should be directed to KL, risyaiee@msn.cn.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Medical Ethics Committee of the Department of Medical Psychology, Army Medical University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

KL, LL, NL, and TC: data acquisition. KL and LR: formal analysis. KL, XZ, XL, and ZF: writing. KL, LR, LZ, XZ, XL, and ZF: review and editing. All authors contributed to the article 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/fpsyt.2022.853951/full#supplementary-material

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REVIEW
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A Scoping Review of Gender Differences in Suicide in India

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Introduction: Much of the published literature on suicide comes from high income countries. In countries such as India, female suicide rates exceed the global suicide rate and suicide rates found in their male counterparts. Results from previous studies indicate that factors related to suicide among men and women in India are different from those seen in high-income countries. To date, no reviews have considered the relationship between gender and suicide in India. Therefore, the aim of this scoping review is to provide a comprehensive understanding of existing literature reporting gender differences in suicide rates, methods, risk factors and antecedent factors in India by reviewing published studies.

Method: A scoping review was conducted to map the existing literature on gender differences in suicide in India. To identify peer-reviewed publications, online databases PsycINFO and Embase were searched. The search terms were [suicid* AND India*]. The searches took place in November 2020 and May 2021, with no language restrictions. Articles published from 2014 onwards from India were included. Reference lists of selected studies were searched for studies that could meet the inclusion criteria.

Results: This review identified 17 studies that met the inclusion criteria. The ratio between women and men who die by suicide in India is much lower than in high-income countries. Hanging was found to be a more commonly used method of suicide among both men and women, in comparison to high-income countries where hanging is more common among men. This review also identified several gaps in the literature. There were few studies that examined suicide among transgender Indians. There was limited literature on gender differences in risk and protective factors for suicide. Limitations such as the omission of a lack of gender-based analyses in several studies and under-reporting of suicide rates were identified.

Conclusion: Understanding suicide within the context of individual countries is essential in designing culture-appropriate suicide prevention strategies. This review identified an urgent need to establish and evaluate suicide surveillance systems in India. Furthermore, additional research is warranted to understand suicide among individuals who identify outside the gender binary, and gender-specific risk and protective factors.

Keywords: suicide, gender differences, India, scoping review, mental health

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INTRODUCTION

Suicide is a major challenge to global public health. The World Health Organisation (WHO) estimates that around 800,000 suicide deaths occur worldwide every year, with an annual global age-standardised suicide rate of 10.5 per 100,000 population (1). Many countries lack suicide registration systems (2), which affects the accuracy of the estimated suicide rate and gender differences. Registration systems of good quality are more likely to be found in high-income countries (HICs); 95% of suicides in HICs are estimated through good-quality registration data from 39 countries, while only 8% of suicide data in low and lower middle-income countries (LMICs) are estimated through good quality registration data from 21 countries (2).

For those countries where suicide data is available, the suicide rate in men exceed those found in women (2). However, the suicide rate among men and women can differ by region and age group. Age-disaggregated data shows that in some parts of the world, female suicide rates are higher than the global average, and exceed those rates found in their male counterparts (1). Evidence gathered on antecedent factors, risk factors, and protective factors for suicide from HICs may not be applicable in LMICs, as the latter often have fewer healthcare resources and significantly different sociocultural factors (3, 4) that affect sex differences in suicide. Available data indicates that while males in HICs have a higher suicide rate (19.9 per 100,000) compared to males in LMICs (13.7 per 100,000), a reversed trend is observed in females. Rates of suicide are higher among females from LMICs compared to females in HICs (8.7 per 100,000 as compared to 5.7 per 100,000) (5). In LMICs, suicide rates in females comprise 43% of all suicides, while in HICs, this is 23% of all suicides (6). The male:female suicide ratio is lower for low-income regions in the South-East Asia Region (SEAR), with a male:female ratio of 1.57: 1. Due to under-reporting of data, it is possible that these rates could be higher, especially in South Asian countries (7).

India has a population of more than 1.3 billion, which is roughly one sixth of the world's population (8). India accounts for the majority (82%) of suicides among countries in the SEAR and has the highest suicide rate among all countries in the SEAR, thus making this an important country within the region for suicide prevention. In 2016, the suicide rate in India was 16.5/100,000, which was higher than the global average of 10.5/100,000 (1). The suicide rate in India for the 15–29 age group is 36.1 per 100,000 for females and 34.9 per 100,000 for males (2). Suicide was the leading cause of death in the age group of 15–39 years for women in India (9), thus emphasising the need to examine the epidemiology of suicide and its relation to gender in this country.

Scoping reviews are indicated when the aim is to provide an overview of existing literature and identify gaps in this literature, while a systematic review is conducted to appraise the strength of evidence for theories or treatments, confirm current practises in a field, identify conflicting results, and to understand the quality of existing studies (10). A limited amount of reviews to date have included a focus on gender and suicide in India. A systematic review on suicide in India had been conducted by Rane and Nadkarni (11). This review provided a general overview of suicide rates, methods and demographic factors of suicide decedents in India. Similarly, Jordans et al. (7) conducted a scoping review on suicide in South Asia (7). While this scoping review identified gender differences in suicide rates, gender differences in other factors such as methods, risk factors, antecedent factors were not assessed. Since there have been no previous reviews that specifically examined gender differences in suicide in India, a scoping review on gender differences in suicide in India would be an appropriate tool to examine the scope of literature and provide a contemporary overview of the studies available on this subject. The aim of this scoping review is to provide a comprehensive synthesis and understanding of the literature on gender differences in rates, methods, risk factors and antecedent factors for suicide in India.

METHOD

Definition

For the purpose of this review, suicide is defined as the act of deliberately killing oneself; gender is used to describe the characteristics of women and men that are socially constructed, while sex refers to those characters that are biologically determined (12). In this review, the term sex or gender has been used depending on the term the author of the cited paper has chosen for their study.

Search Strategy

The Joanna Briggs Institute (JBI) guidelines (13) for scoping reviews were followed for this review. A scoping review of peer-reviewed publications was conducted to map the existing literature reporting gender differences in rates, methods, risk factors and antecedent factors for suicide in India. The studies in this review were expected to have diverse approaches to measurement of suicide data. In such cases, a meta-analysis is not recommended since genuine differences in effects may be obscured (14).

Published studies were identified using the following strategy. To identify peer-reviewed publications, online databases (PsycINFO and EMBASE) were searched, encompassing literature in the field of psychology, medicine, and health sciences. The search terms used were: [suicid* AND India*]. The searches took place in November 2020 and May 2021, for studies that were published starting from May 1, 2014. Identification of relevant studies was based on screening the title and abstract of identified studies. Reference lists of identified studies were searched for studies that met inclusion criteria. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension Fillable Checklist (PRISMA-ScR) (15) was followed.

Including grey literature in a review can provide a more comprehensive view of the available evidence. While peer-reviewed literature ordinarily utilises a specific format, grey literature can differ in format and length, which makes their inclusion and analysis time- and resource-intensive (16). As the time required to review these documents and identify specific information within them would be considerable, it was beyond the scope of this review to include grey literature.

Inclusion and Exclusion Criteria

Articles published from May 2014 onwards focussing on suicide in India were included. This date was selected to provide a recent overview of gender differences in suicide in India, since the most recent review examining suicide data in India by Rane and Nadkarni (11) covered studies before 2014. Studies were included if they examined suicide rates, suicide methods, risk factors for suicide, or antecedent factors for suicide in Indians and were conducted in India. Both quantitative and qualitative studies were eligible for inclusion. Papers were excluded if they did not provide relevant information on suicide in India or were published before 2014. Editorials, commentaries, and studies with data from newspapers were excluded.

During the initial screening of publications, articles were included if it was unclear whether the data examined suicide attempts or suicide deaths. The full text of these articles was then reviewed to determine whether the study examined self-harm, suicide attempts, or suicide deaths. Only data on suicide deaths from these studies were included for the narrative synthesis. Similarly, for those studies that only assessed gender differences for one variable of interest (for example, only rates of suicide were reported), the study was included, but only relevant information was extracted. PR screened studies and extracted data from selected studies. Any questions around study eligibility were jointly discussed and resolved by PR, PT, RM and CR. PR summarised the findings from the studies included.

Data Extraction

Data from the studies were entered into a pre-piloted extraction form. The form included details on authors, year of publication, location of the study, study aims, period of data collection, method and type of data collected, suicide rates, methods, risk factors, and antecedent factors.

RESULTS

The PRISMA study selection flowchart is provided in **Figure 1**. A total of 1900 studies were retrieved from database searching, with 1474 studies from Embase and 426 studies from PsycINFO.

Study Characteristics

A total of 17 studies were included in this review. **Supplementary Table 1** shows the characteristics of the studies selected. Most studies originated from South India (two from Andhra Pradesh and one from Tamil Nadu), with two studies from North, East, and Central India and one from the North-East (Sikkim). The studies predominantly made use of a cross-sectional study design (82% of studies). Seven studies used data from the National Crime Records Bureau (NCRB) database, which includes data from all parts of the country. NCRB data is compiled through police records based on First Information Reports (FIRs). FIRs of unnatural deaths state the apparent cause of death based on the collection of evidence, and autopsy reports where available. Although these reports gather data from every state and originate from official reports, they cover only around 25% of deaths in rural India (17, 18). Hospital records and autopsies were the second most common sources of data, followed by police records. Of these, three studies used police records, while one study used a combination of autopsy records and community surveillance. One study included data from multiple sources, as part of the Global Burden of Diseases (GBD) study (9). The sample size of included studies ranged from 14 to 2036, with a median sample size of 230.

Rates of Suicide

Out of the seventeen studies that were included in the review, fifteen studies reported suicide rates (**Supplementary Table 1**). Out of these, two did not report gender differences. These studies used different methods to analyse rates of suicide, therefore making comparisons difficult. Suicide rates among men were higher than rates for women in all the thirteen studies that reported gender differences. The GBD study, which utilised multiple data sources for estimating cause-specific mortality in India, found that suicide was the leading cause of death in the age group of 15–39 years for women, and the second leading cause of death among men in the same age group (9).

Methods of Suicide

Out of the twelve studies that reported methods of suicide, nine reported gender differences (**Supplementary Table 1**). Six studies reported hanging as the most common method of suicide for both males and females (19–24). In contrast, a study by Rawat et al. (25) found self-immolation to be the most common method (50.6%) among females. This study also found that poisoning was the second most common (47.1%) method among females, and the most common (82.6%) among males. Access to the means of suicide could potentially explain this difference; this study was conducted in a rural region, where women have better access to combustion fuels used in cooking, while men, a majority of whom are engaged in agricultural work, have access to pesticides and agrochemicals (25). Similarly, poisoning was found to be the most common method of suicide for both males and females in Godavari (18), a district where agricultural labour is the most common occupation.

Sociodemographic Factors

Age

Both males and females within the age group of 18–35 (24) and 15–29 (9) were more likely to die by suicide compared to older (35 and above) age groups (**Supplementary Table 1**). Studies tend to report higher suicide rates among younger females, with ages ranging from 11–20 (20), to 18–30 (25). For males, the highest rates of suicide have ranged from 21–30 years (20) to 35–45 years (25).

Marital Status

Suicide rates were higher among males and females who are married (**Supplementary Table 1**). This ranged from 31% (26) to 66% (21) of all suicide decedents in the study. Among the married decedents of suicide, the male:female ratio was 1.71:1, while for the unmarried, it was 3:1 (27). Only one study reported that suicide was slightly higher among married males compared to unmarried females (28).

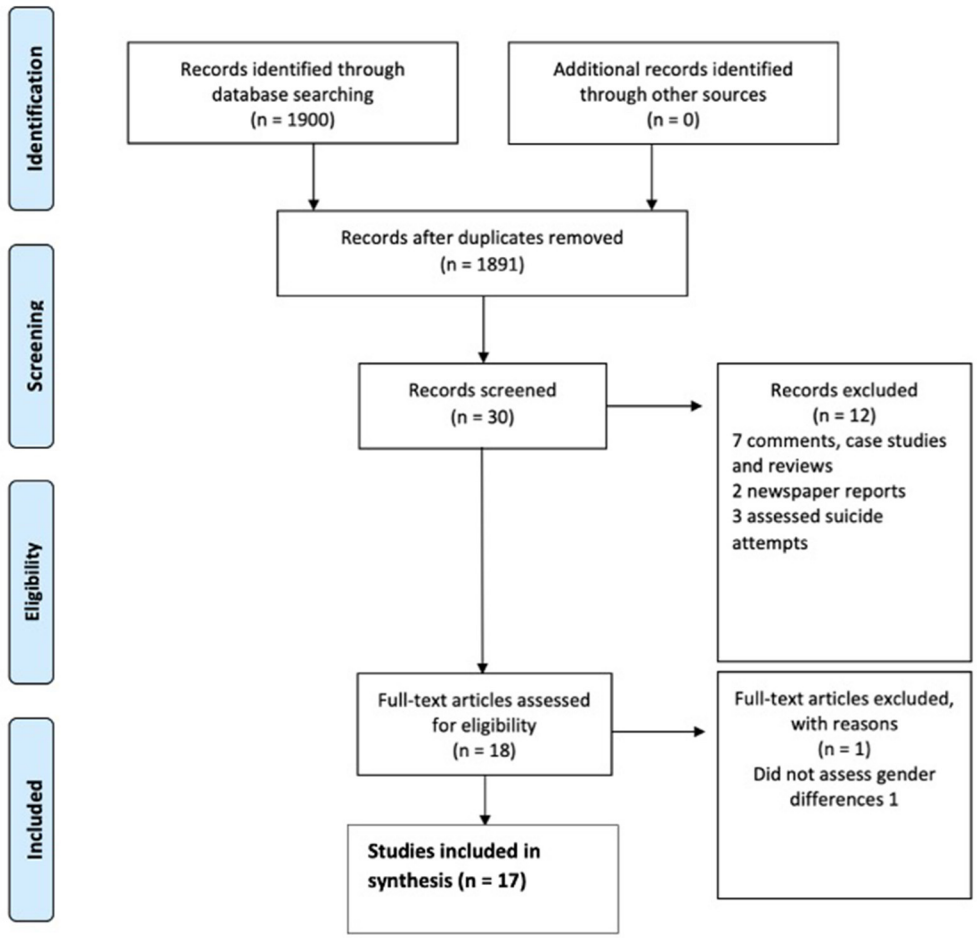

FIGURE 1 | PRISMA flow diagram of study selection.

Education and Employment

This review found that females who die by suicide are more likely to be literate (28) and have a secondary education (19) (**Supplementary Table 1**). They are also likely to be a housewife (19, 24, 29), or unemployed (28). Dandona et al. found that a majority (57.4% on average) of female deaths by suicides were among housewives, and this rate remained stable for a decade (2001–2010) (29). Males who die by suicide were more likely to report having a secondary education (19) and be employed as a daily wage-worker (24), farmer (24, 29), or be self-employed (24, 29). The suicide rate was higher in those with a secondary education for both males (27.99%) and females (28.68%), compared to graduates and those with primary education (19). Contrary to what was seen in females, suicide was more commonly reported among employed males (28).

Suicide in Specific Populations

There were two studies that looked at suicide in specific populations—Bardale and Dixit (30) examined suicide among prisoners, and Mohandoss and Thavarajah (31) studied suicide among Indians with cancer. Bardale and Dixit (30) found that over the years 2009 to 2011, approximately 27.48% custodial deaths were recorded as cases of suicide, which is higher than the suicide rate seen in the general population. A majority (92.85%) of these deaths were male. This can be explained by the fact that only a small percentage (3.6%) of the Indian prison population is female (32). Similarly, the rate of suicide among Indians living with cancer were found to be 1.4 times higher compared to the general population and males living with cancer had a higher suicide rate compared to females, although this rate is steadily decreasing (31). This decrease in suicide rates has been attributed to improving quality of treatment and prognosis for cancer compared to earlier decades.

Antecedent Factors

Seven studies assessed reported antecedent factors (**Supplementary Table 1**). Of these, only four assessed gender differences. Among males, family problems, drug abuse or addiction, physical and mental illness (19) were most commonly reported as antecedent factors. For females, marital disharmony

(21), family problems, mental illness, and failure in exams have been reported as antecedent factors (19).

COVID-19

One study (24) examined the effect of Covid-19 on suicide rates in India (**Supplementary Table 1**). A total of 59 deaths by suicide were observed in the first study between 21st March and 30th May 2020, during the first period of lockdown. Hanging was the most common method for males and females during lockdown. Those between the ages of 18 to 35 were most likely to die by suicide during this time. Financial loss, unemployment, poverty and hunger were identified as antecedent factors for suicide in males, while anxiety and depression, domestic conflict and violence were reported as antecedent factors for females. Comparisons to suicide rates before the pandemic could not be made, as this study did not report suicide rates observed in this region prior to the lockdown.

DISCUSSION

Key Findings

The results of this review provide an overview of the literature on gender differences in suicide in India. This review also aimed to identify gaps in the literature. It was found that the suicide rate for males was higher than the rate for females in all studies that reported gender differences. This review identified hanging as the most common method of suicide for both males and females. Suicide rates were particularly high among women in the younger age group (15 to 39 years), men and women with a secondary education, married individuals, housewives, and employed men.

Rates of Suicide

Given methodological differences in how the rates of suicide were calculated, it was difficult to make comparisons between studies in this review. However, most studies reported a higher proportion of male suicide decedents. In 2016, the suicide rate in India was estimated to be 16.5/100,000, which was higher than the global average of 10.5/100,000 (1). India accounts for 36.6% of global suicide deaths in women and 24.3% among men, despite accounting for only 17.8% of the global population (9). The suicide ratio for women in India (14.7 per 100,000) is 2.1 times higher than the global average, while for men the suicide ratio (21.2 per 100,000) is 1.4 times higher than the global average (9).

The suicide rate in older adults (95 years and older) were high for both men and women. Suicide rates in older men were higher than those seen in older women—one study reported that the suicide rate was 80.8 per 100,000 in men, and 40.6 per 100,000 in women (9). This is consistent with the data from around the world which reports high suicide rates among older adults (2), although this study also reported that a large proportion (around 71%) of suicide in India was in the age group of 15–39 years. The suicide rate was higher in women compared to men of the same age for younger age groups (14 and below to 29 years) for the majority of studies that reported age-disaggregated data. The percentage of total deaths due to suicide is also higher in women than men among young adults (15 to 29 years) (9). This is different from suicide rates seen in Western HICs, where men generally have a higher suicide rate (19.9 per 100,000) compared to women (5.7 per 100,000) (2), thus highlighting the importance of identifying age-disaggregated gender differences in the suicide rate in countries of differing income levels.

Methods of Suicide

Similar differences were found for methods of suicide in Indians. Firearms and hanging account for a higher proportion of suicide deaths across the globe (33, 34), since these methods have higher lethality (35). An earlier systematic review on suicide in India reported that men use more violent methods of suicide, such as jumping in front of trains and firearms (11). This is consistent with data from the WHO mortality database, which showed that hanging and firearms are commonly used methods of suicide among men (36). Globally, women are more likely to die from poisoning (37). However, a majority of studies in this review found that hanging was the most common method of suicide among men and women in India, followed by poisoning. These finding challenge assumptions of gender differences in the choice of method of suicide in HICs. For example, a common assumption is that women use poisoning, a less lethal method, as their intent to die is low and it increases the possibility of intervention (38). This is challenged by the finding in this review that hanging, a method that is considered more "masculine" and lethal, is common among both males and females. Another explanation for the method of suicide that has been proposed in HICs is the concern regarding bodily disfigurement, and female suicide attempters' desire to avoid this either due to social expectations for female physical appearance, or because of concern that loved ones might find their mutilated figure (38). This assumption is also challenged in this review, since hanging and self-immolation were reported in female suicides, with the latter having a high proportion of female decedents.

Another assumption in HICs is that gender norms decrease the likelihood that women will have access to, or be familiar with methods of suicide with a higher lethality such as firearms (38). The state-specific differences in suicide methods found in this review indicates that this assumption might be relevant in the Indian context. Regional differences, such as the proportion of the population engaged in agricultural work and state-level laws that restrict the use of pesticides could explain this pattern. Poisoning is the leading method of suicide in predominantly agricultural states due to accessibility of pesticides used in farming, whereas hanging was the most common method of suicide in less agricultural states (29). One study found that restriction of access to pesticides was accompanied by a decline in suicide by poisoning, and an increase in suicide by hanging (23, 39). Hospital- or community-based studies can provide more relevant, localised information about methods of suicide and its relation to sociodemographic characteristics such as occupation.

Sociodemographic Factors Associated With Suicide

This review found that suicide rates were higher among married people, both men and women. This is in contrast to the review by Rane and Nadkarni (11), which found that suicide was higher among married women. This could indicate a change

in the demographic pattern for studies published after 2014. Nevertheless, both results contradict risk factors seen in HICs such as the United States, where the risk of suicide is lower in married individuals (40). The most common antecedent factors for suicide identified in this review are marital and family problems. This, supports Rane and Nadkarni's findings, thus highlighting the importance of cultural issues surrounding marriage and family, and its potential influence on suicide in India. However, it is unclear whether "family problems" and "marital problems" are perceived distinctly for different genders. A study of suicide in LMICs and HICs found that women had relatively higher suicide rates in countries where laws were discriminatory against women—for example, countries where women had unequal rights in family law with regard to divorce and inheritance, limited access to land and non-land assets, etc. (41). It is possible that these legal issues could also cause or be the result of "family problems" for women. Previous studies have also suggested that the higher suicide rate in younger women could be a result of domestic violence and demands for dowry from the husband's family (42). Suicide is more common 1 to 5 years after marriage, implying that women go through a period of tolerance before "seeking escape" through suicide (42). Alcoholism is another factor that could impact men and women differently—among men, alcoholism led to conflicts with family and financial issues, while among women, alcoholism was reported in the context of their husband's drinking and subsequent exposure to domestic violence (43). This suggests that the term "marital problems" and "family problems" could have different meanings for men and women. However, due to the lack of qualitative studies, there were no studies in this review that discussed how family problems could be distinct for men and women, and whether discriminatory laws influenced suicide rates in women.

Suicide rates were higher among men who were self-employed or employed as a daily wage worker. For women, suicide rates were higher among housewives. This may reflect demographic factors rather than risk factors, as men are more likely to report being self-employed or engaged in daily wage work, while women are more likely to be unemployed or housewives (44).

However, the data on the relationship between education and suicide is more conflicting. While previous studies have found that for both men and women in India, illiteracy and lower levels of formal education were associated with a high risk of suicide (45–47), this review found that suicide was higher among those with a secondary education compared to those who had only completed primary education or had completed higher secondary schooling. This supports findings by Arya et al. (48), who identified a trend of lower suicide rates among states with lower levels of literacy, and a nationally representative survey by Maselko and Patel (45) which also identified higher suicide rates in those who completed higher education, compared to those who had completed primary-level schooling (49). This could potentially be explained by geographic differences, as educational attainment varies widely within different states and districts in India (50).

Gaps and Limitations in the Literature

This review found several limitations in suicide literature in India. First, comparisons between studies were difficult because of the differences in methodology and analysis. For example, some suicide rates were age-adjusted, while most were not, and several studies did not report gender differences for rates, methods, risk factors and antecedent factors. Only variables that were disaggregated by gender from these studies could be included. Additionally, the NCRB database is the most commonly used reference for suicide rates in India, and a majority of the studies identified in this review utilised figures from this database. There are several limitations to the data available on rates and methods for suicide through this source. The NCRB data is not collected for the primary purpose of suicide surveillance, and is dependent on information collected through FIRs submitted to the police. This information is often unreliable, since deaths by suicide are often reported as illness or an accident to avoid registering a case with the police (51). Families may also forgo reporting to avoid post-mortem examinations, due to the fear of mutilation of the body and stigma associated with suicide (51). Additionally, a scoping review on suicide in South Asia (7) found that a nationally representative cause of death survey reported significantly higher suicide rates compared to the figures published in the NCRB. This survey found that the NCRB underestimates suicide deaths in men by at least 25% and women by at least 36% (49). This was also reflected in the GBD study, which utilises data based on verbal autopsies and community surveillance programmes (52). This study found that the NCRB generally reported lower suicide rates compared to the GBD study, especially for females and in the youngest (15–29 years) and older age groups ($\geq$60 years). Older adults in India predominantly live in rural areas, where under-reporting of suicide is common. Arya et al. (23) also propose that under-reporting of suicide in this population may occur due to the misclassification of suicide as accidental death due to overdose on prescription medication (52). Therefore, it is possible that the higher suicide rates observed in this review for males and younger individuals can be attributed to the method of data collection. The suicide rates for females may exceed those found in their male counterparts for different age groups when data is extrapolated from multiple relevant sources, as confirmed by the GBD study and the survey conducted by Patel and colleagues.

Contradictory results were also found for methods of suicide. Some studies in this review have concluded that poisoning is the most common method of suicide, based on NCRB data. However, studies in this review that report suicide data from police records and hospital records identified hanging as the most common method of suicide for men and women. This, supports findings from a systematic review on methods of suicide in South Asia (53), which found that hanging was the most common method in India over two decades (2001–2020). Therefore, studies that examine gender differences using suicide data from the NCRB should be interpreted with caution.

Second, there have been few studies that examine the prevalence of suicide among the transgender community in India. It is estimated that around 50% in this group have

attempted suicide before the age of 20 (54). The lack of literature on suicide among transgender individuals is especially concerning given the number of risk factors that this group is exposed to; previous studies have documented experiences of discrimination and violence that transgender persons face in multiple social and institutional contexts (55). Although the NCRB uses categories of male, female, and transgender for suicide data, most studies in India treat gender as binary. Moreover, the reporting of suicide data is dependent on reports from family members, and these reports may not contain accurate data about a person's sexual or gender identity. Since there are several terms to describe different gender identities in India (56), research needs to be more inclusive to develop a better understanding of suicide among those who identify outside the gender binary.

Third, there were few studies that looked at various risk and protective factors. Although most of the studies in this review identified demographic factors related to suicide, there were few studies that specifically examined the role of potentially important risk factors that have been identified in studies from HICs. For example, research on protective factors from HICs (6) and LMICs (57) indicate that suicide rates are lower during pregnancy and the postpartum period. Data from the GBD study indicates that deaths attributable to suicide in pregnant women from the Southeast Asia region were lower than suicides among all deaths of women in this region (57). Moreover, gender differences in potential risk factors such as interpersonal violence, caste-based discrimination, and psychiatric diagnoses were not reported in the studies identified in this review. This could be explained by the fact that several studies used data from the NCRB, which does not include information on psychiatric illnesses and mental health issues, previous suicide attempts, or substance use. Other studies from India that use psychological autopsy method have associated suicide with psychosocial stressors, psychiatric illnesses, and alcohol use disorders (58). Further studies in the Indian context, particularly those that collect information through hospital records and psychological autopsies, or utilise a case-control design, are necessary to understand whether factors such as motherhood and pregnancy, psychiatric diagnoses etc can act as risk or protective factors in the Indian population.

Scoping reviews are especially suitable for addressing region-specific issues where availability of data may be limited. This review had the strength of providing a comprehensive overview of recent literature on gender differences in suicide in India. This review provided recent evidence that supports the findings of Jordans, et al. (7) and Rane and Nadkarni (11), both of which identified high rates of suicide among young people, especially women. Additionally, this review identified several gaps in the literature. Some limitations of this scoping review are important to note. Due to the variation in reporting of suicide data, a meta-analysis could not be conducted, although this is not recommended for scoping reviews (13). Moreover, restricting the review to a specific time period meant that changes in suicide data over decades could not be assessed. However, this enabled the review to uncover recent data on gender differences in suicide. For example, the GBD study identified that although female suicide rates have declined since the 2000s, the proportion of global suicide deaths in India has increased more for women than for men. Additionally, the timeline and resources for this review allowed for the search of only two electronic databases. It is possible that some relevant studies, including qualitative studies on gender and suicide, could have been identified if more databases had been included in the search process.

Recommendations

These findings have important implications for future research. For instance, suicide surveillance systems need to be established in India in regions where they currently do not exist. Nationally representative surveys of suicide, such as the one conducted as part of the GBD study (29), are important in understanding suicide at the national level. Additionally, the reported suicide rates in India were found to be high compared to the global average, especially for younger women. Further research is necessary to address the gaps in the current literature, including gender-specific risk and protective factors for suicide.

Conclusion

Suicide is particularly concerning in LMICs such as India, where resources to handle suicide prevention are scarce. A scoping review of research on suicide and gender in India was conducted. This review focused on rates of suicide, methods of suicide, risk factors and antecedent factors for suicide. The suicide rate and proportion of deaths by suicide were particularly high in young women. Hanging was found to be the most common method of suicide. This review also identified several gaps in literature, such as the lack of literature on individuals who identify outside the gender binary of male and female, and the need to understand gender differences in risk and protective factors for suicide.

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PR wrote the manuscript. PT, RM, RR, and CR contributed to manuscript revision and editing. All authors contributed to the conception and planning of the scoping review.

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SUPPLEMENTARY MATERIAL

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SYSTEMATIC REVIEW
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The Effectiveness of Self-Esteem-Related Interventions in Reducing Suicidal Behaviors: A Systematic Review and Meta-Analysis

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Suicide is a serious social issue and is often treated using psychological interventions. The current systematic review and meta-analysis aimed to investigate the effectiveness of self-esteem-related interventions on suicidal behaviors. A systematic literature search for randomized controlled trials (RCTs) including a self-esteem component was conducted on 29 May 2021 and updated on 4 April 2022. In total, 12 studies were included in the systematic review and five studies were included in the meta-analysis. Small effect sizes were found for suicidal ideation at post intervention [$g = -0.24$, 95% CI (−0.48, 0.00)] and a 3-month follow-up [$g = -0.36$, 95% CI (−0.62, −0.11)]. However, these results should be interpreted cautiously due to the limited number of included studies and varied sample population. In conclusion, the current review suggests that future intervention studies should incorporate self-esteem enhancement in the treatment of suicidal behaviors, especially for suicidal ideation.

Systematic Review Registration: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=250882

Keywords: self-esteem, psychological interventions, suicide, suicidal ideation, suicide prevention

INTRODUCTION

Suicide is seen as a global phenomenon. The World Health Organization reported that approximately 800,000 suicide deaths occur per year, which means that one person dies by committing suicide every 40 s (1). Suicide is considered a serious social issue because it not only affects the deceased person but also leaves a tremendous impact on suicide survivors and the economy. In terms of its social effects, a recent study in United States demonstrated that a single suicide death can affect up to 135 people (2). Additionally, family members and close acquaintances left behind by the suicide victim usually experience social withdrawal, guilt, self-blame, mental disorders and are even at risk of committing suicide (2, 3). In terms of the economic consequences, suicide death is suggested to lead to a loss of productivity from those engaging in suicidal behaviors and the family members left behind (4). Thus, more research into intervention programs to prevent future suicide is imperative.

A meta-analysis of RCTs from the last five decades revealed that while interventions were effective in reducing suicidal thoughts and behaviors, the effect size was small across all studies (5). This result was similarly replicated in another review using the adolescent population over 26 years (6). These studies suggested that future suicide intervention research should use different approach and focus on targeting the underlying mechanism of suicide (5, 6).

One possible mechanism for suicide is self-esteem. Low self-esteem is associated with negative mental health consequences and has been linked with 21 different disorders in the Diagnostic & Statistical Manual of Mental Disorders (DSM-5) as diagnostic criteria, associated features, risk factors or consequences (7). On the other hand, high self-esteem has been shown to predict positive mental well-being, including higher levels of happiness (8), life satisfaction (9) and self-enhancement tendencies (10). A unique characteristic of self-esteem is that it is susceptible to change, especially among children and adolescents (11, 12). Thus, due to the strong association between self-esteem and mental health outcomes, and the malleable nature of self-esteem, self-esteem-based interventions might potentially be able to improve mental health (13).

The relationship between self-esteem and suicide has been researched extensively in the past few decades. Low self-esteem has been identified as one of the most significant risk factors for suicide risk and suicidal behaviors (14–17). Furthermore, self-esteem was shown to have a unique relationship with suicidal ideation beyond what could be explained by depression and hopelessness, which are two of the most common risk factors for suicide (14). In another study, low self-esteem in childhood was suggested to be a significant risk factor for the development of suicidal ideation in young adulthood (18). In contrast, high levels of self-esteem have been indicated to mitigate suicide risk (19). Thus, increasing self-esteem has been suggested as an effective treatment against suicide-related behaviors (20–22).

So far, only one meta-analysis has explored the relationship between self-esteem and suicide (23); it reported that low self-esteem is a significant risk factor for suicide attempts in youth. Additionally, there are several reviews that attempted to examine the effectiveness of self-esteem interventions but with some limitations (7, 11, 24, 25). First, two reviews (11, 25) defined self-esteem interventions as interventions comprising an outcome measure of self-esteem. While this inclusion criterion could increase the number of included studies, this is problematic as it is likely that self-esteem enhancement happened incidentally in the included studies and not as one of the treatment targets. Furthermore, it could make it difficult to determine whether changes in self-esteem in fact lead to better treatment outcomes. Second, three reviews (11, 24, 25) focused only on the effectiveness of self-esteem interventions on the self-esteem outcome while ignoring other psychological outcomes. Since self-esteem interventions are likely to increase self-esteem, it is beneficial to also consider how the interventions improve other psychological outcomes. Kolubinski et al.'s (7) review is the only exception that did not suffer from the above-mentioned issues. They suggested that a CBT treatment based on Fennell's cognitive model of low self-esteem can significantly improve self-esteem and may also be effective against depression. Notably, to date, no systematic review or meta-analysis has investigated the effectiveness of treatment focused on self-esteem in suicide prevention.

In summary, previous literature demonstrates that self-esteem is an important factor in the development of suicidal behaviors. Despite this evidence, the effectiveness of self-esteem-based interventions in prevention of suicidal behaviors remains unclear. Thus, the present review and meta-analysis aims to investigate whether treatment incorporating self-esteem enhancement is an efficacious approach to suicide prevention. This review distinguishes itself from previous reviews in several ways. First, we include only those studies that incorporate self-esteem as a treatment target in the intervention program, regardless of whether or not self-esteem is measured as an outcome. Thus, we call these types of interventions self-esteem-related interventions instead of self-esteem interventions like previous reviews. Second, the current review includes only those studies that have a suicidal outcome, such as suicidal ideation, suicide plan, or non-suicidal self-injury (NSSI). While NSSI and other suicidal behaviors are often differentiated, previous studies and theories have also shown that these two types of behaviors can often co-exist. For example, the role of NSSI is emphasized in Joiner's theory of suicide, which states that NSSI could directly increase an individual's acquired capability for suicide by making them accustomed to fear and pain (26).

This review and meta-analysis have two aims:

(1) To investigate the types of treatment or methods used to enhance self-esteem in suicide prevention.
(2) To evaluate the effectiveness of interventions that incorporate self-esteem enhancement for reducing suicidal behaviors.

METHODS

This review and meta-analysis were conducted line with the PRISMA recommendations (27) for reporting systematic reviews and meta-analyses. The protocol for this review was registered with the PROSPERO database, registration number CRD42021250882. The research strategy was developed following the Patient, Intervention, Comparison and Outcome (PICO) guideline. In the current review, patients were those who experienced suicidal behaviors and participated in a suicide prevention program using a self-esteem-related intervention. The target intervention was any psychological intervention that incorporated a self-esteem component. Self-esteem is defined in the present study as a "positive or negative attitude toward a particular object, namely, the self" [(28) p. 30]. Following this definition, interventions that included other related self-concept (e.g.: self-worth, self-criticism or self-image) in its treatment program were also included in this review. The comparison group was not limited or specified, and any type of comparison could be included. For outcomes, selected studies must include measures of suicidal thoughts and behaviors.

Literature Search

Search terms were developed to identify studies that assessed the effectiveness of self-esteem-related psychological interventions in reducing suicidal behaviors. The key search terms included: (self-esteem or self-concept or self-perception* or self-identit* or self-crit* or self-attack* or self-worth or self-efficacy or self-image) and (intervention* or program* or lesson* or treatment* or psychotherapy or psychoeducation) and (suicid*). These terms were searched in the PsycINFO, PubMed and Web of Science databases for publications from inception to 29 May 2021. In addition, the clinical trial register database (www.clinicaltrials.gov) was searched to detect additional studies that had not yet been published. Similar reviews investigating the effectiveness of self-esteem interventions were also scanned for related studies. Finally, backward and forward reference searching was conducted using the included studies. In the PsycINFO and PubMed databases, Medical Subject Headings or MeSH terms were also added (see **Appendix A** for the full search strategy). The search was performed by the first and second authors. A second database search was undertaken on 4 April 2022 by the first author; no new article was found.

Selection of Studies

Studies were included if they met all the following criteria

(a) Stated that one of the main targets is to enhance self-esteem (or related self-concepts)
(b) Reported suicide-related outcomes. Suicide-related outcome here includes (1) suicidal ideation, defined as the thoughts about engaging in suicidal behaviors; (2) suicide attempt, defined as an act which leads to a non-fatal outcome but with an intention die; (3) suicide plan, defined as a serious planning about how one would kill oneself; and (4) NSSI, defined as the deliberate, self-inflicted destruction of body tissue without the intention of suicide
(c) Used a randomized controlled trial (RCT) study design
(d) Published in a peer-reviewed journal
(e) Full text is available in English

Studies were excluded if they met any of the following criteria:

(a) Were not intervention studies (e.g., case studies, qualitative studies).
(b) Did not include a self-esteem component in the intervention program
(c) Did not report the assessment of a suicide-related outcome.
(d) Did not follow an RCT study design.
(e) Not published in a peer-reviewed journal (e.g., dissertation)
(f) Full text is not available in English

Data Extraction

The following information was extracted from the articles to a spreadsheet: author names, year of publication, intervention design, duration, sample size, setting, diagnostic criteria, mean age and gender composition, country, co-morbidity, control group, number of participants in each group, outcome measures on suicidal behaviors, and outcome assessment timepoints. Data extraction was conducted by the first author and checked by the second author. When required data were unavailable, we emailed the corresponding author of the concerned article and requested access to missing data.

Risk of Bias

Cochrane Collaboration's tool for assessing risk of bias in randomized trials (29) was used in the current review, which assessed the following domains: (a) sequence generation; (b) allocation concealment; (c) blinding of participants, personnel, and outcome assessors for each outcome; (d) incomplete outcome data; and (e) selective outcome reporting. It has been suggested that an overall judgment about the level of bias should not be made and a specific score should not be assigned, as different forms of bias are likely to be relevant depending on the nature of the research (29). Therefore, risk of bias for all criteria was reported individually in the current review.

Data Synthesis and Analysis

The included studies were synthesized and summarized narratively. Studies suitable for meta-analysis were included and analyzed using Review Manager (RevMan, version 5.4).

Meta-analysis was conducted to determine the effectiveness of interventions on suicidal outcomes. Standardized mean difference (SMD) was calculated due to the differences in the measurement scale. The SMD was calculated for post intervention and follow-up using Hedges' adjusted g. At post intervention, SMD was calculated for suicidal ideation. Follow-up data were sparse and varied in follow-up duration (ranging from 4 weeks to 6 months). However, four studies reported results for suicidal ideation at 3-month follow-up; thus, these data were also included in the meta-analysis. Meta-analysis was conducted using a random-effect model as opposed to a fixed-effect model because studies used a wide range of interventions and designs.

I^2 was calculated to assess for heterogeneity in treatment effects. According to Cochran's guideline (29), I^2 can be interpreted as non-significant heterogeneity (0−40%); moderate heterogeneity (30−60%); substantial heterogeneity (50−90%) and considerable heterogeneity (75−100%).

RESULTS

Studies Included in the Review

Figure 1 illustrates the PRISMA flowchart for the study selection process. The database search identified 3,608 articles (2,898 articles after removing duplicates). Next, titles and abstracts were screened by the first author (NTD) to determine their suitability. Through this initial check, 195 papers were selected for screening of full text by the first and second authors (NTD, MN). Disagreements between the authors were discussed until consensus was reached. A total of nine studies were found to meet the inclusion criteria after screening of the full text. Additionally, two studies (30, 31) were identified from (a) backward citation searching of an included study (32) and (b) forward citation searching of an included study (33). An additional study (34) was found through a scan of a similar systematic review (24). Thus, a total of 12 papers were included in this review.

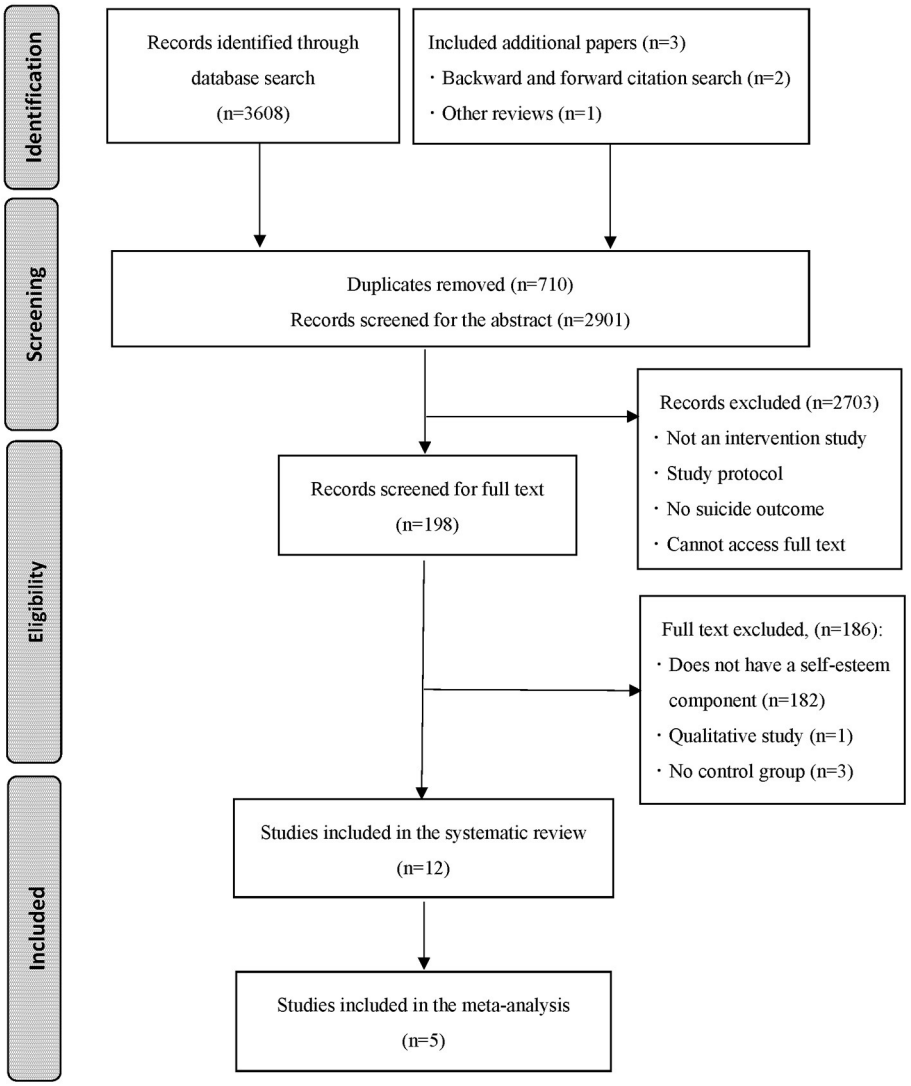

FIGURE 1 | PRISMA flowchart for the process of study selection.

Study Characteristics

The total number of participants in the studies was 1,391. The sample sizes at baseline ranged from 17 to 341 ($M = 100.35$). One study (35) used an all-male sample, and two studies (33, 36) did not report the gender distribution of the sample. When studies that used an all-male sample or did not report the gender distribution of the sample were removed, the average percentage of females for all studies was 66.52%. Nine studies were conducted in the United States (30–32, 34, 36–40), one in the United Kingdom (35), one in Korea (41) and one in Australia (33). The mean age of the samples ranged from 15.42 to 51.86 years, with four studies (36–38, 40) using child or adolescent samples (aged under 18 years), four (31, 32, 34, 39) using young adult samples (aged 18–25) and four (30, 33, 35, 41) using adult samples (aged over 25 years). One study (36) did not report the mean age of the sample but stated that it comprised student in Grade 9–12. Detailed information on sample demographics and study population is given in **Table 1**.

Intervention Characteristics

Individual study characteristics are reported in **Table 2**. The majority of studies focus on self-esteem as a treatment target, with others focusing on related self-concepts, including self-criticism, self-determination, self-efficacy, self-image, self-affirmation, and self-worth. Most of the studies used modified interventions based on existing techniques or theoretical models. Two studies used an intervention focused specifically on changing self-perception through writing (32, 39). One study used an online intervention based on a therapeutic evaluative condition to increase aversion toward suicidal behaviors and reduce self-criticism (31). One

TABLE 1 | Sample characteristics.

Study	Participants (female)	Country	Population	Mean age (years)
Brenner et al. (30)	34 (2)	USA	Veterans with moderate to severe traumatic brain injury	51.6 (10.7)
Clore and Gaynor (34)	30 (22)	USA	Undergraduate students from a large American university who reported significant distress and low self-esteem	21.10 (5.11)
Czyz et al. (37)	36 (28)	USA	Adolescents hospitalized due to suicide risk	15.42 (1.36)
Franklin et al. (31)	114 (92) 131 (97) 163 (96)	USA	Participants recruited from online web forums on self-injury or psychopathology	23.02 (5.47) 22.91 (4.99) 24.5 (6.61)
Hooley et al. (32)	144 (123)	USA	Participants recruited from online forums related to self-injury and severe psychopathology	25.63 (5.83)
Jun et al. (41)	45 (22)	Korea	Hospitalized patients with mental illness	44.95 (15.54)
MacPherson et al. (38)	72 (30)	USA	Children with pediatric bipolar disorder	9.22 (1.59)
Pachankis et al. (39)	108 (76)	USA	Sexual minority young adults	23.68 (3.11)
Pratt et al. (35)	62 (0)	UK	Male prisoners	35.2 (11.10)
Randell et al. (36)	341 (Not reported)	USA	Students in grades 9–12	Not reported
Simpson et al. (33)	17 (Not reported)	Australia	Participants with severe traumatic brain injury with posttraumatic amnesia	41.88 (11.92)
Thompson et al. (40)	108 (58)	USA	High-risk youths in grades 9–12	15.86 (1.03)

study used a safety planning and motivational interviewing approach based on self-efficacy and self-determination theory (37). One study compared the effectiveness of restructuring negative self-thoughts using thought record and strengthening positive self-statements using flashcard rehearsal (34). Other studies incorporated changing self-esteem as part of a treatment using either cognitive behavior therapy (30, 33, 35, 37, 41) or safety planning (36, 40).

All studies were RCTs with nine (30, 31, 33–35, 37, 38, 40, 41) using a two-arm design and three (32, 36, 39) using a three-arm design. In terms of the control group, two studies (30, 33) compared the treatment with a wait-list control, four (35, 37, 38, 41) used treatments as usual, four (31, 32, 34, 39) used an active control, one (40) used assessment only, and one (36) used both active and treatment as usual. In terms of delivery method, five studies (30, 33, 36, 40, 41) reported that treatments were delivered in groups, two studies (34, 35) delivered treatment to individuals, three studies (31, 32, 39) used self-practice, one (38) was implemented as a family intervention, and one (37) combined both family and individual sessions. Additionally, in nine studies (30, 33–38, 40, 41) the intervention was delivered face to face and in three (31, 32, 39) it was delivered online. Treatment ranged from 3 to 36 sessions, with the sessions in most studies delivered one or twice weekly. Sessions typically lasted for 1 h. Follow-up timepoints were reported in 11 studies and varied from 4 week to 39 weeks.

Different suicidal behaviors were used in the included studies, with some reporting multiple suicidal outcomes. Specifically, nine studies measured suicidal ideation, four reported results for NSSI, five reported suicidal behaviors, two reported suicide plan, one reported suicide attempt, and one reported suicide potential. Most studies measured suicidality using the Beck Scale for Suicide Ideation (42). Other measurements such as Columbia-Suicide Severity Rating Scale (43) or Self-Injurious Thoughts and Behaviors Interview (44), were also reported.

Quality of Included Studies

The overall evaluation of risk of bias is reported in **Figure 2**. Sequence generation method was described in detail and appropriately used in five studies, was unclear in four studies and was evaluated as high risk in two studies. Allocation concealment had the highest proportion of unclear risk of bias except for three studies where it was rated as low risk. Blinding of participants and personnel also showed high unclear risk of bias, with five studies rated as low risk. In terms of blinding of outcome assessment, five studies were evaluated as low risk, three as high risk and four as unclear. Risk of bias for incomplete outcome data was evaluated in most studies, with seven studies rated as low risk, four as high risk, and only one was rated as unclear. For selective reporting, three studies published a protocol and thus we were able to compare and confirm their outcomes. One study (34) reported each outcome in detail, so it was also rated as low risk. The other eight studies were rated as high risk. Hooley et al.'s study had the lowest proportion of risk of bias with five out of six domains rated as low risk (32). Randell et al.'s (36) study appears to be the weakest with four domains rated as having high risk of bias. MacPherson et al.'s (38) study had the most unclear risk of bias with five domains rated as unclear. Detailed comments on authors' evaluations of risk of bias for each study are available in **Appendix B**.

TABLE 2 | Intervention characteristics.

Study	Theoretical model	Program outline self-esteem component	Self-concept	Duration	Assessment time points	Provider	Delivery method	Control group	Suicidal outcomes	Suicide scale
Brenner et al. (30)	CBT	Program outline: Window to Hope program is based on principles and techniques from cognitive behavior therapy Self-esteem component: Session 9 "Building Hope" focuses on building self-esteem	Self-esteem	10 weekly 2 h sessions	Pre/3/6 months	Clinicians with doctoral degree in psychology or related field	F2F group	Waitlist control	Suicidal ideation	BSS
Clore and Gaynor (34)	CBT	The study compared two conditions (a) restructuring of negative self-thoughts (*via* training and daily practice using the Thought Record) and (b) enhancement of positive self-statements (*via* fluency training and daily flashcard rehearsal)	Self-esteem	Three weekly sessions. The first session lasted 2 h The second and third therapy sessions each lasted 1 h	Pre/post/5 weeks	The first author, a doctoral student in clinical psychology	F2F individual	Active control: The study compared between restructuring negative self-thoughts using thought record and enhancing positive self-statements through flashcard rehearsal.	Suicidal ideation	Items 9 and 39 from the Brief Symptoms Inventory and item 9 from the Beck Depression Inventory-II
Czyz et al. (37)	Safety planning and motivational interviewing	The full program is based on self-determination theory and self-efficacy theory.	Self-determination Self-efficacy	Not reported	Pre/1/3 months	First and second author	F2F Individual and family	TAU: Recovery action plan, including crisis management strategies and safety planning.	Suicidal ideation and attempts	C-SSRS
Franklin et al. (31)	Therapeutic evaluative condition	A main focus of the treatment is reducing aversion toward the self	Self-criticism	Participants can access the online treatment as desired over the course of 1 month	Pre/post/2 months	None	Online self-practice	Active: TEC, which displays neutral images	NSSI/suicidal ideation/suicide plan/suicidal behaviors	SITBI

(Continued)

TABLE 2 | Continued

Study	Theoretical model	Program outline self-esteem component	Self-concept	Duration	Assessment time points	Provider	Delivery method	Control group	Suicidal outcomes	Suicide scale
Hooley et al. (32)	Writing interventions	Autobiographical Self-Enhancement Training (ASET) – a novel, cognitive intervention for NSSI focused on reducing self-criticism and enhancing positive self-worth	Self-criticism Self-worth	28 days. Participants write for 5 min each day	Pre/post/1/3 months	None	Online self-practice	Active: Expressive writing; Active: Daily journaling	NSSI/suicidal ideation/suicide plan/suicidal behaviors	SITBI
Jun et al. (41)	CBT	Session 2 focuses on establishing a positive self-image	Self-image	8–60 min sessions over 4 weeks	Pre/post	A psychiatric mental health Advanced Practice Nurse	F2F Group (4–5 patients per group)	TAU: medications, activity therapies, and supportive counseling by doctors and nurses	Suicide ideation	BSS
MacPherson et al. (38)	Child and family focus -CBT	A manualized, family-based intervention CBT with psychoeducation and complementary mindfulness and interpersonal techniques. The component "I can do it" focuses on improving children's self-esteem and parents' self-efficacy	Self-esteem	12 weekly 60–90 min sessions	Pre/4/8/12/39 weeks	Pre- and post-doctoral trainees in clinical psychology, who are novice at PBD treatment	F2F Family	TAU: TAU sessions were not manipulated in terms of content or structure	Suicide behaviors NSSI	C-SSRS Non-suicidal physical self-damaging Acts
Pachankis et al. (39)	Writing intervention	Writing intervention using self-affirmation prompts	Self-affirmation	Up to three sessions across three consecutive days	Pre/post/3 months	None	Online self-practice	Active: expressive writing prompts; active: control writing prompt (write about daily activities)	Suicidal ideation	Suicidal ideation attributes scale

(Continued)

TABLE 2 | Continued

Study	Theoretical model	Program outline self-esteem component	Self-concept	Duration	Assessment time points	Provider	Delivery method	Control group	Suicidal outcomes	Suicide scale
Pratt et al. (35)	Cognitive-behavioral suicide prevention therapy	One of the five component focus on improving self-esteem and positive schema	Self-esteem	Up to 20 1-h sessions, delivered twice weekly during the initial phases and once weekly when therapeutic engagement had been established	Pre/4/6 months	Clinical psychologists (doctoral level) with 2–5 years of experience delivering CBT	F2F individual	TAU: received the usual care and support available	NSSI/suicidal ideation/suicide potential	BSS suicide probability scale
Randell et al. (36)	Life skills training	Life skills training program CAST (coping and support training) Provide specific skills training in building self-esteem	Self-esteem	12 1-h sessions over 6 weeks	Pre/4/10 weeks	Specifically trained group leaders	F2F Group (6–7 students per group)	Active: C-CARE Experimental Condition (comprehensive assessment of risk and protective factors and a brief motivational counseling intervention); TAU	Suicidal behaviors	The high school questionnaire
Simpson et al. (33)	CBT	Window to Hope program (WtoH) based on principles and techniques of CBT. Session 9 "Building Hope" focuses on building self-esteem	Self-esteem	10 weekly 2-h sessions	Pre/post/3 months	Therapist	F2F Group (2 people per group)	Waitlist control	Suicidal ideation	BSS
Thompson et al. (40)	Social support and life skills training	Personal Growth Class (PGC) One of the elements is, life-skills training, focusing on four core program components (self-esteem enhancement; decision making; anger, depression, and stress management; and interpersonal communication)	Self-esteem	Daily 55-min sessions from 18 to 36 weeks	Pre/post/5 months	Trained school personnel (e.g., teacher, counselor, or school nurse) who acted as group leaders	F2F Group (12 students per group)	Assessment only	Suicide risk behaviors	Suicide risk behaviors scale

BSS, Beck Scale for Suicide Ideation; CBT, Cognitive behavior therapy; C-SSRS, Columbus-Suicide Severity Rating Scale; F2F, Face to face; NSSI, Non-suicidal self-injury; PBD, Pediatric bipolar disorder; SITBI, Self-injurious thoughts and behaviors interview; TAU, Treatment as usual.

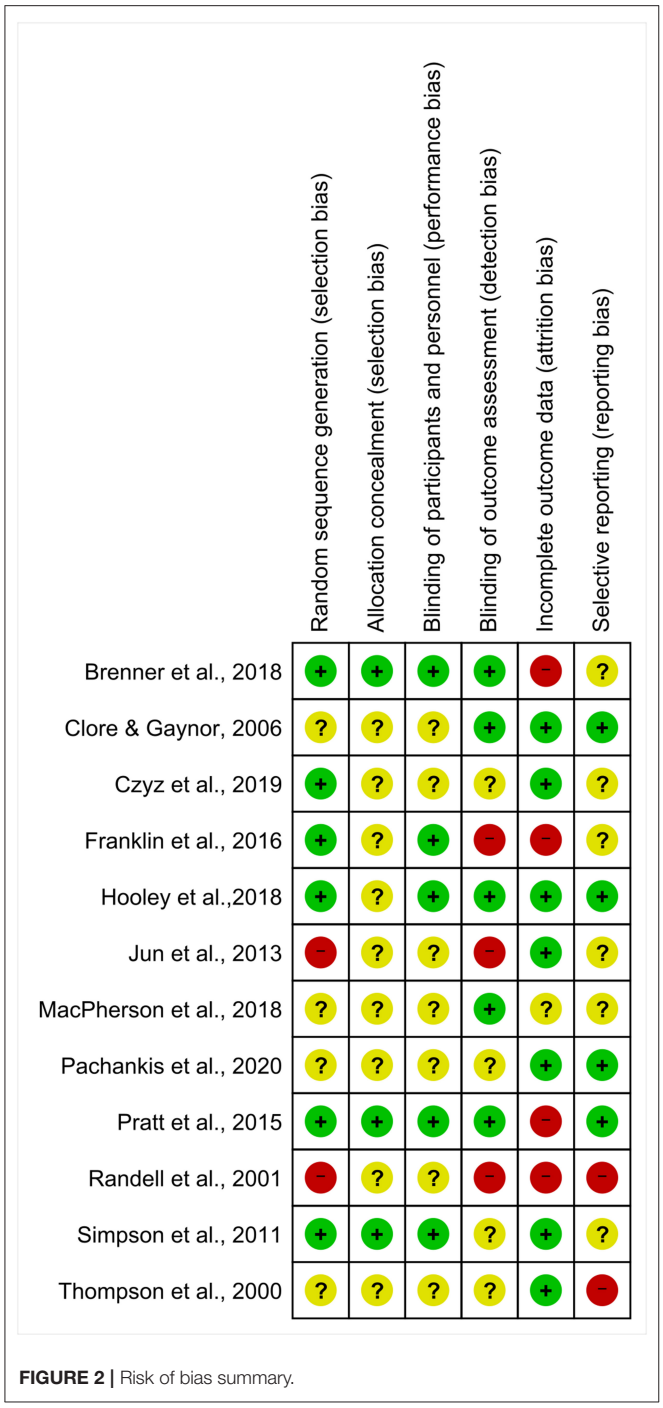

FIGURE 2 | Risk of bias summary.

Overview of Meta-Analyses on Outcome Measures

Necessary data for six studies (32, 35–38, 40) were not available and one study (34) used comparisons between two self-esteem conditions; thus, these studies were excluded from the meta-analysis. Additionally, Franklin et al. (31) reported the data for suicidal behaviors as the sum of suicidal behavior frequencies during each week of the treatment and post-treatment month; thus, their study was also excluded from the meta-analysis. The corresponding authors of the six papers that did not include the necessary data for meta-analysis were contacted *via* email and requested to provide these data. Hooley et al. (32) replied and the data from their study were included in the analysis. The other five did not respond and their studies were excluded from the meta-analysis, though not from the systematic review.

Only data for suicidal ideation was available for the meta-analysis. Follow-up data were available for most studies included in the meta-analysis but with different follow-up timepoints. Following Cochrane's recommendation (29), data at 3-month-follow-up for suicidal ideation was extracted for the meta-analysis.

Effects on Suicidal Ideation at Post Intervention and 3-Month Follow-Up

A total of five comparisons ($N = 289$) from four studies (32, 33, 39, 41) compared a self-esteem-related intervention to a control group at post-intervention. Results revealed that compared with the control condition, the participants in the self-esteem-related interventions experienced a small but significant reduction in suicidal ideation [$g = -0.24$, 95% CI (-0.48, 0.00); **Figure 3**]. The heterogeneity between groups was non-significant and small ($I^2 = 5\%$, $p = 0.38$).

Data for 3-month follow-up for suicidal ideation were available from four studies (30, 32, 33, 39) with five comparisons ($N = 253$). The meta-analysis at 3-month follow-up also yielded a small but significant effect size [$g = -0.36$, 95% CI (-0.62, -0.11); **Figure 4**], showing that the treatment condition was more effective at reducing suicidal ideation. Heterogeneity was low and non-significant ($I^2 = 0\%$, $p = 0.41$).

DISCUSSION

To our knowledge, this is the first systematic review and meta-analysis investigating the effectiveness of self-esteem-related interventions in reducing suicidal behaviors. The database search yielded 12 RCTs studies that used a self-esteem related intervention for suicidality. Among them, only five studies provided sufficient data for the meta-analysis. The results of the meta-analysis revealed that self-esteem-related interventions have a small but significant effect in reducing suicidal ideation at post intervention and 3-month follow-up.

The effect size for suicidal ideation [g = −0.24, 95% CI (−0.48, 0.00)] at post-intervention from the current analysis was compared with similar meta-analysis involving other types of interventions. The results suggest that self-esteem-related interventions could be more effective than self-guided digital interventions [g = −0.18, 95% CI (−0.27, −0.10)] (45), as effective as face-to-face CBT [g = −0.24, 95% CI (−0.41, −0.07)] (46), but less effective than dialectical behavior therapy [g = −0.31, 95% CI (−0.52, −0.09)] (47) in reducing suicidal ideation post intervention.

The results revealed that the included studies used diverse intervention methods. Treatment ranged from CBT to writing intervention, with only three studies (32, 34, 39) using

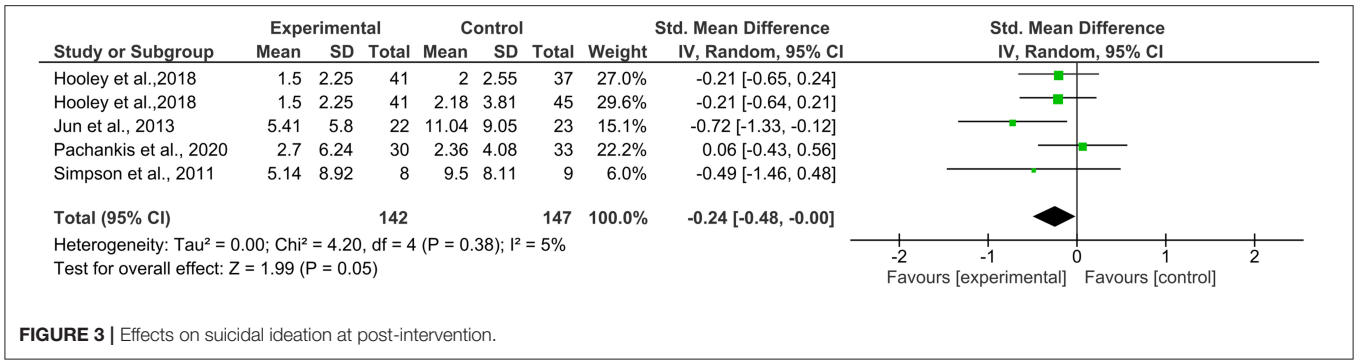

FIGURE 3 | Effects on suicidal ideation at post-intervention.

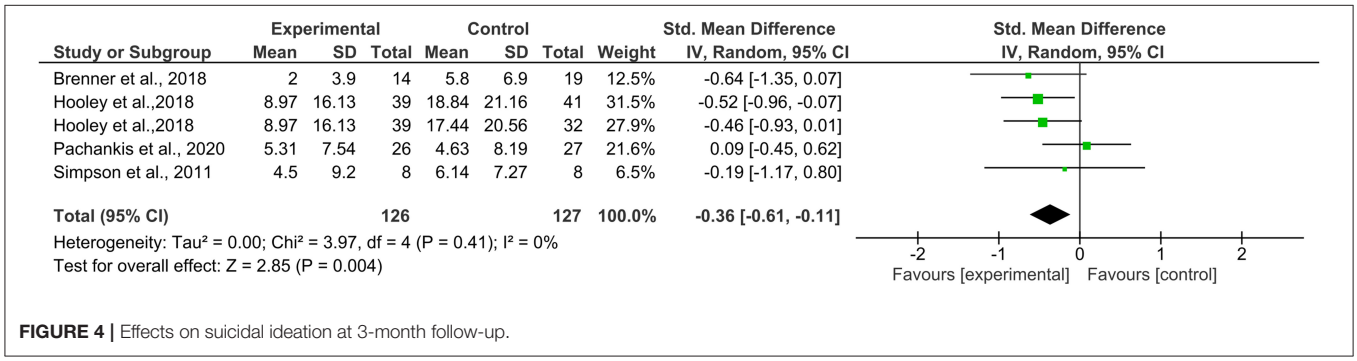

FIGURE 4 | Effects on suicidal ideation at 3-month follow-up.

interventions focused specifically on enhancing self-esteem. Additionally, different therapies have different approaches to self-esteem enhancement. For example, it is suggested that CBT can enhance self-esteem by encouraging individuals to become aware of their own negative predictions and self-critical thoughts, and then reconstruct their negative self-image by challenging and testing the predictions and thoughts (48). For writing interventions, it is believed that writing helps in organizing and altering the way an event is presented in memory, allowing individuals to recall more dimensions of the event and thus helping them have a more objective view of themselves (49). In evaluative conditioning, the way an individual views themselves is restructured by repeatedly pairing words that represent the self (i.e., I or me) with positively valenced stimuli (i.e., positive words or images) (31, 50).

It has been suggested that enhancing self-esteem is effective in the prevention of suicide, as high self-esteem could buffer the negative effects of many psychological risk factors for suicide (23). Specifically, self-esteem has been shown to be a protective factor against several suicide risk factors, namely depression (51, 52), anxiety (52, 53), loneliness (52), and hopelessness (54). Thus, it is possible that when an intervention incorporates or focuses exclusively on self-esteem enhancement, the heightened sense of self-esteem could buffer against the negative impact of risk factors for suicide. The interpersonal theory of suicide offers another possible explanation for how increasing self-esteem might lead to a decrease in suicidal behaviors (55). The theory posits that suicidal desire results from the co-occurrence of thwarted belongingness (i.e., feelings that one is disconnected from others) and perceived burdensomeness (i.e., feelings that one is a burden on others). As self-hate is an indicator of perceived burdensomeness, it is likely that increasing self-esteem helps to alleviate the feelings of being a burden on others and lead to a reduction in suicidal behaviors.

A somewhat surprising finding from the current review is that the effect size for suicidal ideation at the 3-month follow-up was higher than at post-intervention. This result demonstrates that the effect on suicidal ideation caused by self-esteem-related interventions could be maintained even at follow-up. A possible explanation for this result is that the main goal of self-esteem programs is targeting and modifying self-critical thinking (56). Since self-critical thinking has been shown to play an important role in the development and maintenance of psychopathology, it is likely that a program with self-esteem component could lead to long-term maintenance of reduction in suicidal ideation (56, 57).

Limitations

Although these results show a potential for self-esteem-related interventions in reducing suicide, they should be interpreted with caution due to several limitations. The numbers of included papers in this meta-analysis were small with a small sample size and varied sample population, which could lead to a high risk of bias. Different suicidal outcomes and follow-up periods also made it difficult to calculate the pooled effect size. Further, unlike previous studies (11, 24, 25), the current systematic review and meta-analysis limited the definition of self-esteem intervention to only those studies that incorporate self-esteem as one of the treatment components. However, it must be noted that most of the studies included in the review not only include self-esteem enhancement but also other treatment modules. This makes it

difficult to isolate self-esteem as the cause of reduction in suicidal behaviors. Nevertheless, we used broad inclusion criteria because, so far, there are few interventions that focus specifically on enhancing self-esteem. Furthermore, the Cochrane guidelines for the systematic review of intervention studies also suggest that reviews with broad inclusion criteria are feasible and encouraged because the results could provide clues regarding whether an intervention operates differently in certain conditions (in this case, whether self-esteem-related intervention is effective in reducing suicide) (29). Some of the included studies involve high risk of bias in certain domains, especially in blinding of outcome and incomplete outcome data. Lastly, the current review and meta-analysis was unable to control for potential confounding factors, including age and follow-up periods. While trajectory of self-esteem has been shown to change over time (13), we were unable to separate data between the adolescent group and the adult group in the current review due to the small number of studies. Similarly, given the enduring nature of suicide (55), studies with longer follow-up periods are needed to confirm these results. Thus, our conclusion must be interpreted with caution because of methodological limitations of analyses.

Implications for Practice

While self-esteem has been demonstrated to play a crucial role in mental health and well-being, self-esteem-based interventions remain nascent. As high self-esteem could protect against suicidality, it is possible that interventions for suicide may improve treatment efficacy by focusing exclusively on enhancing self-esteem or at least incorporate self-esteem enhancement as part of their treatment targets. Furthermore, while some self-esteem interventions or related psychological models currently exist (e.g., the intervention program "Everybody's Different"; the CBT model for low self-esteem) (58, 59), current evidence for these types of interventions is limited. Thus, new interventions that focus specifically on self-esteem or are established on self-esteem theory should be developed and evaluated. Additionally, as self-esteem has been suggested to be susceptible to change during young age (11, 12), it is possible that integrating self-esteem improvement into school curriculum may help to prevent future suicidal behaviors.

CONCLUSION

In summary, this is the first systematic review and meta-analysis on the effects of self-esteem-related interventions in reducing suicidal behaviors. The findings suggest that self-esteem-related interventions are effective in reducing suicidal ideation at post intervention and 3-month follow-up. However, due to the broad inclusion criteria and limited number of studies, these results should be interpreted with caution. Moderators such as intervention length, delivery method, and the contents of intervention should be investigated in future review. Finally, future studies should also assess the long-term benefits and mechanisms of change for each type of intervention.

DATA AVAILABILITY STATEMENT

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

AUTHOR CONTRIBUTIONS

Conceptualization: NM. Study design, literature searches, studies screening, and visualization: NM and ND. Data analysis and writing—original draft: ND. Writing—review and editing: ND, NM, YK, SA, YF, KTo, KTa, and IK. Supervision and final script validation: NM, YK, SA, YF, KTo, KTa, and IK. All authors contributed to the article 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/fpsyt.2022.925423/full#supplementary-material

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Anticipated Self and Public Stigma in Suicide Prevention Professionals

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Background: Stigma about mental illness—both public and self—is one of the most important factors hindering help-seeking. Stigma can occur during an acute episode of mental illness or be anticipatory. One group affected by stigma, but often neglected, is mental health professionals. This study examined the anticipated form of mental-illness and help-seeking self-stigma and the anticipated form of public stigma of suicidal behavior among members of the International Association for Suicide Prevention. We hypothesized that suicidologists with a history of suicidality or mental illness would anticipate greater stigma from the public and self.

Methods: The study received ethical approval from the Commission for Medical Ethics of the Republic of Slovenia. Data from 83 participants who completed an online survey (February to May 2020) with informed consent were analyzed using path analysis. We tested a model predicting help-seeking self-stigma based on (i) personal experience of mental illness using anticipated self-stigma of mental illness as a mediating variable and (ii) history of suicidal behavior using anticipated public stigma of suicidal behavior as a mediating variable.

Results: Personal experience of mental illness predicted anticipation of self-stigma of mental illness ($\beta = 0.26$). History of suicidality predicted anticipation of public stigma of suicidal behavior ($\beta = 0.29$). Anticipated self-stigma of mental illness proved to be a stronger predictor of help-seeking self-stigma ($\beta = 0.40$) than anticipated public stigma of suicidal behavior ($\beta = 0.07$).

Conclusions: It is important to intentionally support the mental health of suicide prevention professionals, as they are not immune to mental illness or various types of stigma. Because our sample was small and diverse, further research to better understand stigma concepts in this population is warranted.

Keywords: anticipated stigma, self-stigma, mental illness, help-seeking, suicidal behavior, suicidologists

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INTRODUCTION

Mental illness accounts for 7% of the global disease burden and 19% of years lived with disability (1). It, directly and indirectly, affects various forms of premature mortality, including suicide. Although effective treatments are available for various mental illnesses and suicidality, the treatment and help-seeking gaps remain high (2). The treatment gap is primarily due to structural barriers,

such as access to help, unrecognized mental illness, or unrecognized suicidal behavior, whereas attitudinal barriers and associated stigma contribute substantially to the help-seeking gap (3, 4).

Stigma is a multidimensional phenomenon characterized by labeling, stereotyping, and separation, leading to loss of status and discrimination (5, 6). Stigma, especially when it occurs in the context of mental illness, can have even more harmful effects than the mental illness itself (7) and can be a risk factor for suicide (8).

Stigma can be broadly divided into two types: (i) public stigma, i.e., the way a person perceives public attitudes and opinions about mental illness and people with such illnesses, and (ii) self-stigma, i.e., internalized public stigma, which is composed of the attitudes and opinions that affected individuals have about themselves and their reference group (9, 10). Self-stigma is related to low self-esteem and low self-worth and can be divided into mental illness stigma and help-seeking stigma (10, 11), related yet independent constructs (10). Similarly, suicide-related stigma can be divided into public stigma and self-stigma (12). The public stigma of suicide involves labeling suicidal individuals as weak, irresponsible, selfish, and unable to cope with their problems. In contrast, the self-stigma of suicide refers to the concealment of suicidal behavior and feelings of shame among those who have attempted suicide (13).

The relationship between age, gender, and various concepts of stigma remains unclear, as the literature does not provide consistent results. Some studies found that older adults report less public stigma and self-stigma related to mental illness (14). In contrast, a systematic review and meta-analysis (15) found that age was not significantly associated with the self-stigma of mental illness. Regarding the influence of gender, some studies found that men tended to have higher public stigma and self-stigma associated with psychological help-seeking (16), whereas other found that help-seeking self-stigma was significantly higher in women than in men (17).

Stigma can be experienced and internalized during an acute episode of mental illness, but it can also be anticipated. Anticipated stigma refers to the belief and expectation that one will face prejudice, discrimination, stereotyping, and devaluation from others in the future if others know about their issue (18, 19). Anticipated stigma is a strong predictor of psychological distress and predicts people avoiding or underutilizing needed health care services (19). Self-stigmatizing beliefs, either anticipated or directly experienced, are associated with withdrawal from social support, rejection of help, and avoidance of treatment (20).

Stigma affects not only the general population but also mental health professionals who are vulnerable to burnout (21, 22), mental illness, such as depression (23, 24), and suicidal behavior (25). Professionals' mental health knowledge does not make them immune to such conditions (26, 27). On the contrary, their prior experiences of adversity, distress, and mental health problems, may be one of the reasons they pursue a career in mental health (28). According to studies, mental health professionals tend not to seek out the services they provide (27). They are more likely to disclose in their social circles than in work circles (28). The reason for this may be that they are trained to help others in distress and therefore tend to have high expectations of themselves (26, 29). This combination may reinforce the process of denial about one's psychological distress, shame, and hesitation to seek help (26, 29). They may fear being perceived as less competent by the public and colleagues, or even lose their license (27), and therefore avoid disclosing problems, asking for help, or approaching a colleague they believe is struggling (30, 31). People with mental illness face stigma and may avoid disclosing their mental health issues, which can be even more apparent when working in the mental health field. In addition, many stigmatizing attitudes toward people with mental illness come from mental health professionals, which can contribute to not admitting personal mental health struggles and seeking professional help (32). Delaying seeking help can have a detrimental effect on mental health and increase the risk for suicidal behavior. For example, studies have found that 61–82% of psychologists had a lifetime prevalence of depressive symptoms (23, 24, 33) and 42% experienced anxiety (33). Pope and Tabachnick (23) found that 29% of therapists had suicidal ideation, and 4% had attempted suicide. Studies have also shown a higher risk of suicide among medical professionals (34–36). The ratio of suicide rates among physicians compared to the general population is 1.4 for male physicians and 2.27 for female physicians (37, 38).

Considering that suicide prevention professionals are a specific type of mental health professionals and as any other population may be at risk for developing mental illness and suicidal behavior—particularly because distress of working with suicidal clients may pose an additional risk to their mental health (27)—it is important to understand the factors that hinder or facilitate help-seeking in this population. To the best of our knowledge, anticipated self and public stigma in suicidologists has not yet been studied. Our study represents the first attempt to illuminate this important issue. Its purpose was to examine various types of stigma and their predictors among suicide prevention professionals. We examined the relationships between their age, gender, past or present mental health problems, personal suicide experience, years being active in suicidology, anticipated self-stigma of mental health and help-seeking, and anticipated public stigma of suicidal behavior.

MATERIALS AND METHODS

Participants and Procedure

Suicide prevention professionals come from a variety of professional and academic backgrounds. The International Association for Suicide Prevention (IASP) brings together academics, mental health professionals, and crisis workers dedicated to preventing suicidal behavior and mitigating its effects. Members of IASP are diverse according to their work type (e.g., clinicians encounter the topic of suicidality differently from researchers and academics). However, we believe that professionals deciding to join IASP have a specific relation to the topic of suicidality compared to non-members. They likely have more knowledge about it and show more interest, making the group relatively homogeneous despite having different backgrounds. We considered IASP members to be experts in suicide prevention and thus an appropriate group for this study.

The study received ethical clearance from the Commission for Medical Ethics of the Republic of Slovenia (Ref. No. 0120-609/2019/5), and it conformed to the Declaration of Helsinki provisions in 1995.

We invited potential participants via the IASP mailing list to participate in an online survey (in English language). An invitation was sent to 518 international e-mail addresses in the IASP database (all addresses available at the survey time). The survey was constructed on platform 1KA (39). The introduction page explained the survey's objectives, and by proceeding with the survey, participants confirmed that they were giving their informed consent to participate anonymously and have their data used in the research. The survey was active from 24 February to 24 May 2020. We mailed two reminder e-mails to the potential participants.

Three hundred three individuals accessed the survey. Out of them, 190 chose not to participate, 24 partially completed the survey, and 89 participants completed the survey (17% response rate). We excluded six participants with education atypical for suicide prevention professionals from the analysis. In the final sample ($N = 83$; 51 females, 32 males), most participants were mental health professionals (psychiatrists 27%, clinical psychologists 20%, and psychologists 10%), followed by teachers/professors (8%), sociologists (6%), health professionals (medical doctors 3%, nurses 2%), and allied (health) professionals (social workers, public health researchers, epidemiologists, etc., 23% in total).

Instruments

Participants reported on sociodemographic data (age, gender, profession, years of activity in the field of suicidology) and personal experience with mental illness (ever having experienced or currently experiencing mental health problems) and suicidality (suicide ideation and attempt). To provide at least a minimum of intervention to those who were in distress at the time of the survey, we included the following disclaimer: "If you experience distress, we recommend that you speak to someone close (e.g., a family member, a friend, a colleague) or, if necessary, contact local telephone helplines, a doctor, or a mental health professional." The disclaimer was presented in the Introduction section and again at the end of the survey.

To capture both subtypes of self-stigma related to mental illness, we used two questionnaires: The Self-Stigma of Mental Illness—SSOMI (11) and The Self-Stigma of Seeking Help—SSOSH (40). The authors refer to their questionnaires as instruments for measuring (experienced) self-stigma. However, because the items are phrased in terms of "would" (e.g., I would feel inadequate if I had a mental illness; I would feel inadequate if I went to a therapist for psychological help), we considered the instruments to measure anticipated self-stigma. Both questionnaires consist of 10 items rated on a 5-point Likert scale (1–strongly disagree; 5–strongly agree). The final score of both questionnaires ranges from 10 to 50, with higher scores indicating higher levels of self-stigma. In our study, both questionnaires showed good internal consistency. The Cronbach's alpha coefficient was 0.90 for SSOMI and 0.85 for SSOSH.

To assess the stigma related to suicide, we used the Personal Suicide Stigma Questionnaire–PSSQ (41). The questionnaire consists of 16 items rated on a 5-point scale (1–never; 5–very often). The final score ranges from 16 to 80 points, with a higher score indicating higher stigma. The original version of the questionnaire was designed to measure the responses that individuals with personal experience of suicidal behavior receive and perceive from their social environment. For our study, we modified the questions to apply to individuals with and without personal experience of suicide. The modified questions were asked in the "as if" form. For example, the original statement reads: "I have been treated as less competent by others when they learned about my suicidal thoughts or behavior." In contrast, the modified version reads: "I would be treated as less competent by others if they learned about my suicidal thoughts or behavior." Therefore, we considered the modified version to measure the anticipated public stigma of suicidal behavior. The modified version of the questionnaire showed good internal consistency (Cronbach's $\alpha = 0.93$).

RESULTS

Table 1 presents the descriptive statistics of the sociodemographic variables, personal mental health history variables, and scores on the stigma scales. Approximately half of the sample reported mental health problems (past or present), and one-third reported suicidality (either suicidal ideation or attempt) in the past. The most prevalent reported mental health problem was depression (33%), followed by anxiety (24%). Of 42 (51%) participants who had experienced mental health issues, 9 (21%) reported not seeking professional help. Of 31 (37%) who had experienced suicidal ideation, 13 (42%) reported not seeking help for that.

Table 2 shows the correlations between the variables. Low correlations of gender with the personal stigma of suicidal behavior and self-stigma of mental illness were observed, with women showing slightly higher stigma. Age and years active in suicidology did not correlate with different types of anticipated stigma. Personal history of mental health problems was associated with anticipated self-stigma of mental illness. Participants with such history ($n = 42$, $M = 32.83$, $SD = 7.79$) showed higher anticipated self-stigma of mental illness than those without such history ($n = 41$, $M = 28.78$, $SD = 7.86$). Personal history of mental health problems was also associated with suicidal behavior and anticipated suicide-behavior public stigma (**Table 2**). There was a small positive correlation between the presence of suicidal experience and anticipated public stigma of suicidal behavior. The latter was higher in participants with suicidal experience ($n = 31$, $M = 50.13$, $SD = 12.79$) and lower in participants with no such experience ($n = 52$, $M = 44.73$, $SD = 11.57$).

We further examined the relationships between the anticipated mental-health and help-seeking self-stigma, the anticipated public stigma of suicidal behavior, and personal experiences of mental health issues and suicidal behavior. Due to the low number of data available, we tested a simple model

TABLE 1 | Descriptive statistics for the examined variables ($N = 83$).

Variable	*M* (*p*)	SD	Skewness	Kurtosis
1. Gender	0.61[a]	–	–	–
2. Age	51.77	13.36	0.15	−0.74
3. Years active	17.15	11.94	0.83	0.05
4. Mental health issues	0.51[b]	–	–	–
5. Suicidal behavior experience	0.37[c]	–	–	–
6. PSSQ	46.75	12.25	−0.11	−0.38
7. SSOMI	30.38	8.04	−0.36	−0.20
8. SSOSH	20.19	6.88	0.27	−0.71

PSSQ, the Personal Suicide Stigma Questionnaire (anticipation form) scale score; SSOMI, the Self-Stigma of Mental Illness scale score; SSOSH, the Self-Stigma of Seeking Help scale score.
All SD values reported in this paper were calculated as estimates of population σ.
[a]Proportion of women. [b]Proportion of participants with mental health issues in the past or at present. [c]Proportion of participants with personal suicidal behavior experience.

TABLE 2 | Correlations between the examined variables ($N = 83$).

Variable	1	2	3	4	5	6	7
1. Gender							
2. Age	−0.32**						
3. Years active	−0.34**	0.80***					
4. Mental health issues	0.26*	−0.23*	−0.23*				
5. Suicidal behavior experience	0.15	−0.15	−0.10	0.41***			
6. PSSQ	0.26*	0.00	−0.16	0.29**	0.21		
7. SSOMI	0.26*	−0.15	−0.14	0.25*	0.23*	0.45***	
8. SSOSH	0.10	0.07	0.03	0.01	0.07	0.25*	0.46***

PSSQ, the Personal Suicide Stigma Questionnaire (anticipation form) scale score; SSOMI, the Self-Stigma of Mental Illness scale score; SSOSH, the Self-Stigma of Seeking Help scale score.
Pearson correlation coefficients were used for pairs of interval variables and phi-coefficients for pairs of binary variables.
$^{*}p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

in which a history of mental health issues and suicidal behavior predicted the anticipation of self-stigma for mental health and public stigma for suicidal behavior, respectively. Both types of stigma were used as predictors of anticipated self-stigma for help-seeking (see **Figure 1**). We conducted path analysis using the *cfa* function from the *lavaan* package in R (42) and the diagonally weighted least squares (DWLS) estimator of the parameters with bootstrap standard error estimation on 5,000 samples and the alpha error rate of 0.05. According to Hu and Bentler (43), the fit of the model tested to capture the complex relationships between variables (**Figure 1**) was marginally acceptable, $\chi 2(4) = 6.12$, $p = 0.19$, CFI = 0.96, RMSEA = 0.08, 90% CI for RMSEA = 0.00–0.20, SRMR = 0.07.

Table 3 shows the estimates of the parameters in the tested model. Prior personal experience of mental illness statistically significantly predicted anticipated self-stigma for mental illness ($\beta = 0.26$; 95% bootstrap confidence intervals for the estimates excluded the value 0). Similarly, prior personal experience of suicidal behavior predicted anticipation of public stigma for suicidal behavior ($\beta = 0.29$). The disturbance (error) terms for self-stigma of mental illness and suicidal behavior self-stigma were correlated ($\psi = 0.45$). Anticipated self-stigma of mental illness statistically significantly predicted anticipated help-seeking self-stigma ($\beta = 0.40$). At the same time, the anticipated public stigma of suicidal behavior showed no independent contribution to the anticipated help-seeking self-stigma ($\beta = 0.07$).

DISCUSSION

To our knowledge, this was the first study to examine the different concepts of anticipated self and public stigma and personal experience of mental illness and suicidality as their predictors in suicide prevention professionals.

The prevalence of mental health problems history found in our sample (51%) was slightly lower than in studies of psychologists (27), therapists (23), counseling psychologists (24), and clinical psychologists (33), and the prevalence of suicidality history (37%) was slightly higher than in some other studies (23). Both figures support the position of Good et al.'s (26) that mental health professionals may also be at risk despite their extensive knowledge of suicide and mental health problems (38). The average scores for SSOMI (30.4) and SSOSH (20.2) in our sample were slightly lower than in some other studies [for example, see studies (11, 44)]. Most of these studies included samples (either

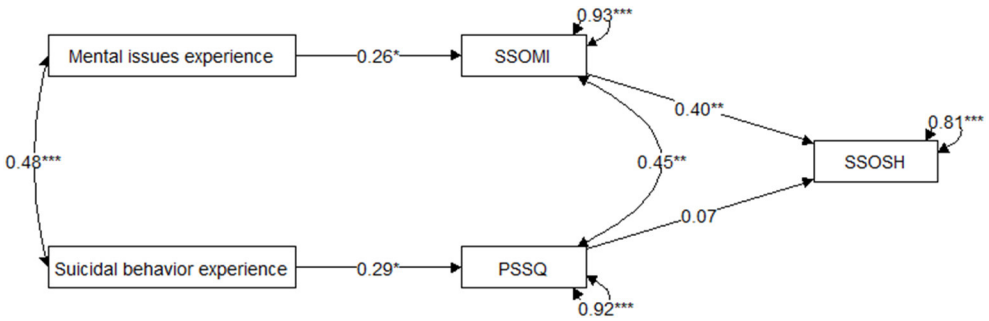

FIGURE 1 | Model Predicting Anticipated Help-Seeking Self-Stigma Based on Personal History Variables With Anticipated Self-Stigma for Mental Illness and Anticipated Public Stigma for Suicidal Behavior as Mediators. PSSQ, the Personal Suicide Stigma Questionnaire (anticipation form) scale score; SSOMI, the Self-Stigma of Mental Illness scale score; SSOSH, the Self-Stigma of Seeking Help scale score. $^{*}p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

TABLE 3 | Regression coefficients in the tested model.

Outcome	Regressor	Estimate	Standard error	95% BCI	Standardized estimate
SSOMI	Mental health issues	4.24	1.95	0.23, 7.84	0.26
PSSQ	Suicidal behavior experience	7.32	3.00	1.12, 12.85	0.29
SSOSH	SSOMI	0.34	0.12	0.10, 0.55	0.40
	PSSQ	0.04	0.09	−0.13, 0.20	0.07
	Mental health issues∼∼Suicidal behavior experience[a]	0.12	0.02	0.06, 0.16	0.48
	SSOMI∼∼PSSQ[b]	40.99	12.79	18.52, 69.40	0.45

PSSQ, the Personal Suicide Stigma Questionnaire (anticipation form) scale score; SSOMI, the Self-Stigma of Mental Illness scale score; SSOSH, the Self-Stigma of Seeking Help scale score.
95% BCI = 95% bootstrap confidence interval for the estimate.
[a]*Covariance of the two regressors.* [b]*Covariance between the disturbances for the two scale scores.*

undergraduate students or community samples) with previous mental health issues. In contrast, our sample included both individuals with and without such experience in our study. In this sample, individuals with prior experience with mental illness had higher SSOMI and SSOSH scores than other participants. Such individuals most likely responded from the perspective of their lived experience, whereas other participants without such experience responded from an anticipatory perspective.

The mean score of the PSSQ in our study was comparable to the mean score obtained by Rimkeviciene et al. (41) in a convenience sample of Australian adults who reported having been suicidal at some point in their lives. In their study, the mean score was 43.9 for those who reported suicidal ideation and 56.2 for those who also reported a suicide attempt. In our sample, the mean PSSQ score (50.13) of participants with suicidal experience (either suicidal ideation or suicide attempt) was in the interval between these two scores. However, the results cannot be directly compared with those of previous PSSQ studies as we used a modified version of the PSSQ, which we assumed captured the anticipated public stigma of suicidal behavior rather than personal stigma.

To summarize, anticipated self-stigma for mental illness and seeking help was lower in our sample than in other studies. At the same time, we made no such observations regarding anticipated public stigma for suicidal behavior. It seems that suicide prevention professionals in general are open to the possibility of experiencing mental health problems themselves and even seeking help but are less open to the possibility of experiencing suicidality. In addition, almost half of the participants with suicidal ideation experiences did not actually seek help for that. This finding may reflect their attitudes of being strict toward their own experiences of suicidality, which may emerge from the high expectations they have of themselves concerning these matters. The finding deserves to be studied further.

Previous studies reported that individuals with mental illness internalize public stigma and develop self-stigma that includes feelings of shame and incompetence (10, 13). People who have experienced mental illness often report feeling devalued and rejected (45). Similarly, our study found that prior personal experience with mental illness significantly predicted the anticipation of mental-health self-stigma (which may be based on the actual experience of such self-stigma). We also found that such stigma predicted help-seeking self-stigma. Professionals' decisions to disclose their problems in the workplace and seek help may be hindered by shame or fear of being judged negatively or of negative effects of disclosing mental health problems on their career and self-image (28, 33). Thus, mental-health self-stigma can be critical in a professional setting because it can negatively impact feelings of professional competence. This can lead to a vicious cycle: A professional may want to maintain

the image of a competent professional (to the public, their clients, and their colleagues) and avoid seeking mental health treatment. Delaying help-seeking can have detrimental effects on mental health, including suicidality development. Beside mental-health (anticipated) self-stigma, other barriers to help-seeking for mental health professionals may be important, such as difficulty of finding an acceptable therapist, lack of time or financial resources, or privacy concerns (22).

The notion that professionals may be motivated to maintain an image of being free of mental illness in the eyes of their colleagues is supported by the finding that many stigmatizing attitudes come from mental health professionals themselves (32). The more someone believes and expects that others stigmatize seeking help, the more likely they are to endorse this stigma themselves (46). Health care specialists are often reluctant to seek professional treatment for mental illness (47). They may fear social stigma and have difficulty finding a local provider they trust, or they may try to treat their mood disorder with self-prescribed medications before seeking help. The fact that 58% of invited participants accessed our survey but only 17% completed it may also be due to stigma and lack of recognition of the importance of this issue among professionals.

When asking a colleague for help, both parties may underestimate the severity of the crisis (34). Personal mental health problems must be addressed and highlighted by all professionals. Providers who assess and help health professionals should use the same assessments and interventions used for nonprofessionals (34). Perhaps an even more critical step in addressing suicide prevention professionals would be to examine their suicidal ideation, as our findings suggest that many of those who had suicidal ideation did not seek help.

Our study has several limitations. The most important one was a small sample and low response rate, limiting the generalizability of the findings and resulting in low statistical power and relatively large standard errors. Due to the small sample size, we could not enter in the model other relevant variables, such as gender, age, or years of activity in the field. We found that age did not correlate with different types of anticipated stigma, which was consistent with the results of meta-analysis by Livingston and Boyd (15). Women in our sample showed slightly higher anticipated public stigma of suicidal behavior and self-stigma of mental illness. Future studies should examine more closely the role of gender in predicting different types of stigma in mental health experts.

In addition, we can only hypothesize about the mental health conditions and stigma among professionals who chose not to participate in the study. Several previous studies (23, 24, 33) have found a higher proportion of mental health professionals with experience of mental health problems than in our study. Because our sample was composed of mental health professionals and other professional profiles working in the field of suicide prevention, it is important to further explore the prevalence of mental health problems among suicidologists as a specific group of mental health experts.

We had planned the survey for March 2020, but as soon as we launched it, the COVID-19 pandemic started, which is likely one of the reasons for the limited response rate, as most professionals faced an additional workload due to the pandemic. This could also possibly lead to a biased sample. For example, mental health professionals experienced a greater workload due to increased number of people in need during the pandemic (48), which limited their availability and willingness to engage in other activities, such as participating in research. It is possible that the slightly lower stigma and prevalence of mental health problems in our sample compared with previous studies was found because more resilient experts responded to our invitation.

The study also did not include a comparison group (e.g., the general public or professionals who do not work in the mental health field). Another limitation is the potential mismatch between the constructs the questionnaires were designed to capture (self-stigma) and the used format of the SSOMI and SSOSH items (in terms of anticipated stigma). Future studies should also examine the construct validity of the adapted PSSQ as a measure of anticipated public stigma of suicidal behavior. This was not possible in our study because of the small sample.

Even though there were no notable correlations between years active in the field of suicidology and different types of anticipated stigma, it would be valuable to explore further the relationship between the level of expertise and stigma, e.g., whether more professional experience and knowledge lead to higher self-expectations and thus more difficulty disclosing one's struggle with mental illness or seeking help, or the opposite is true and there is greater openness to revealing one's mental health issues. The relationship between the prior suicidal history and personal stigma of suicidal behavior also requires further investigation, as does the relationship between gender and mental illness and self-stigma of suicidal behavior. In addition, self-stigma concepts and their predictors should be compared between professionals and the general public to identify characteristics specific to professionals. This could contribute to the development of designated anti-stigma programs. Addressing factors that contribute to the development and perpetuation of stigma among suicide prevention professionals and factors that prevent "coming out" and seeking help could reduce the perceived burden when confronting personal mental health problems and, in some cases, possibly be lifesaving.

To conclude, our pilot study indicates that suicide prevention professionals are, like any other population, vulnerable to mental health issues and suicidal behavior. Those who have experience with mental health problems may anticipate higher self-stigma for mental health, and in turn, may have more concerns about disclosure and help-seeking. Thus, our findings suggest that it is crucial to promote the mental health of suicide prevention professionals and raise their awareness of self-stigma, for example, through regular supervision or addressing these issues in the specialization curricula.

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 Commission for Medical Ethics of the Republic of Slovenia (Ref. No. 0120-609/2019/5). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

SR had the initial idea for the study and contributed to data collection and manuscript writing. DK contributed to online survey development and data pre-processing. KA, KK, and MV contributed to the design of the study and manuscript writing. AP overviewed the research, ran the statistical analysis, and contributed to manuscript writing. All authors contributed to the article and approved the submitted version.

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REVIEW
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The Role of Unemployment, Financial Hardship, and Economic Recession on Suicidal Behaviors and Interventions to Mitigate Their Impact: A Review

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Understanding the social determinants and risk factors for suicidal behaviors underlies the development of effective suicide prevention interventions. This review focused on recently published literature (2010 onwards), with the aim to determine the role of economic factors (at the individual and population level) on suicidal behaviors and ideation as well as the effectiveness of interventions addressing these factors in reducing suicidal behaviors and ideation. Where available, literature examining the economic impact of COVID-19 was highlighted. Economic recession and unemployment are associated with increased risk of suicidal behavior at the population and individual level. Additionally, personal financial problems such as debt and financial strain are associated with increased risk of suicidal behavior and ideation at the individual level. Regarding interventions, unemployment benefits, employment protection legislation, higher minimum wage and active labor market programs may reduce suicide at the population level. However, it is not clear what impact they have at the individual level, nor in relation to suicide attempts, self-harm, or suicidal ideation. There was a lack of evidence as to the effectiveness of financially focused suicide prevention interventions at either level. Current findings were contextualized within, and advance, prominent social theoretical models. Recommendations focused on future areas of research, including the unfolding economic impact of COVID-19, as well as the co-design and evaluation of tailored interventions and/or gatekeeper training for those in the financial and welfare sector, and enhanced early education aimed at increasing financial literacy in young people before onset or exacerbation of financial hardship.

Keywords: suicide, self-harm, unemployment, financial hardship, economic recession, welfare benefits, COVID-19

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INTRODUCTION

Suicidal behaviors and ideation have an immense and far-reaching impact on people, communities, and healthcare systems around the world. According to the World Health Organization (1), ∼703,000 people died by suicide in 2019, representing an age-standardized rate of 9.0 per 100,000. The World Health Organization also estimate that for every suicide there are 20 or more suicide attempts (2). However, estimating the true prevalence of non-fatal suicidal behaviors and ideation

is difficult given challenges with surveillance and an inability to capture the many individuals who do not seek or receive healthcare intervention for their suicide attempt, self-harm, or suicidal ideation (3).

Suicide is a complex, multifaceted issue with many interrelated and co-occurring biopsychosocial determinants at the individual and societal level (4). Understanding the risk and protective factors for suicidal behaviors (including suicide, suicide attempts and self-harm) and ideation is crucial to informing adequate prevention policies and developing effective interventions. Economic factors are critical and established social determinants of health and health equity, whereby those with escalating poverty and financial concerns experience ongoing and systemic issues with their health, including accessing adequate care (5). The detrimental effect of economic factors on mental health and suicide at the individual and societal level is increasingly recognized [e.g., (4, 6)].

Prominent economic factors at the individual level can include, among others, financial hardship (e.g., inability to repay debt), short- and long-term unemployment, underemployment (e.g., working less than desired or required due to economic reasons), overqualification, and job insecurity or precarious employment (7). At the population level (also referred to as aggregated, societal, or ecological level), macroeconomic factors most frequently include the overall unemployment rate, gross domestic product (GDP), and time periods of economic crisis/recession (8, 9). Each of these factors are greatly influenced by global and national economic events and policies, as well as fallout and response to environmental and social disasters (10). Indeed, economic factors at both the individual and societal level are intrinsically linked and mutually reinforcing.

Economic factors have also long been associated with increased risk of suicidal behaviors (8, 9). The literature describes two leading hypothetical models for how economic factors and mental health may influence suicidal behaviors and ideation. The "social causation" model suggests that economic circumstances (e.g., unemployment, job insecurity, financial hardship) result in substantial anxiety and stress (i.e., financial stress) and mental health problems, and ultimately suicidal behaviors. The "social selection" model, however, proposes that underlying (or vulnerability to) mental health problems increase the likelihood of insecure employment, job loss or financial insecurity through social drift (either directly, or indirectly via unfair work practices etc.) and in turn suicidal behaviors (see **Figure 1**) (6, 11, 12). Each proposed model is situated within the broader socio-economic context and likely relate differently across socio-demographic characteristics (e.g., gender, race). Adding to the complexity of the issue, mental health and economic factors may also be further associated with, or influenced by, other prominent risk factors for suicide such as homelessness, social exclusion, or relationship problems (7). Each model, therefore, is not necessarily mutually exclusive (6, 7), and regardless of direction both highlight the intensifying and cumulative role of economic factors in explaining a portion of the risk for suicidal behaviors and ideation.

Altogether, these associations have important implications for suicide prevention. There is a timely need for enhanced understanding of the role of economic factors at both the individual and aggregated level, such as unemployment, underemployment, job insecurity, and financial hardship on suicidal behaviors and ideation, particularly as a result of the ongoing COVID-19 pandemic. It is also crucial that the effectiveness of interventions addressing these factors at the societal and individual level is examined in relation to reductions in suicidal behaviors.

Therefore, the aim of the current review was to synthesize recently published literature (2010 onwards) to answer the following research questions:

1. What is the role of economic factors such as un/underemployment, financial hardship, financial wellbeing, job insecurity, and economic crisis on suicidal behaviors and ideation?
2. What available evidence is there for the effectiveness of interventions addressing economic factors in reducing suicidal behaviors and ideation?

A distinction was made between findings across both the individual and aggregate levels, and the impact of COVID-19 was highlighted where available. Key findings were discussed in relation to furthering theoretical understanding, and recommendations for future research, policy and practice are provided.

MATERIALS AND METHODS

Previous systematic reviews have focused on specific economic variables such as unemployment or combined various related, yet distinct economic factors utilized across the included studies (e.g., unemployment and job insecurity). However, given the co-occurring and compounding associations between economic factors and suicidal behaviors across multiple levels these reviews are often unable to provide a comprehensive overview and a balanced synthesis of knowledge across various research disciplines, high- and lower-income countries, and the spectrum of suicidal behaviors and ideation. Therefore, a selective review of the published literature was undertaken to provide insight into the current state of the field from a broader perspective. The review was not designed to be exhaustive, instead findings were used to provide advances in theoretical understanding (**Figure 1**) and generate ideas for future research and prevention.

Databases and Search Terms

This review used purposive sampling to identify relevant articles from PubMed, Scopus, Google Scholar, as well as the reference lists of relevant studies, reviews, and meta-analyses. The search terms used included a combination of: suicid*, suicidal ideation, suicide attempt*, suicide thoughts, selfharm, self-harm, self-injur*, self injur*, prevent*, unemploy*, underemploy*, debt*, financial strain, job insecurity, financial hardship, job precarity, financial wellbeing, financial counseling, welfare policies, unemployment benefits, public health, mental health, active labor market programmes, unemployment benefits, unemployment protection, employment protection, unemployment insurance, unemployment compensation, social

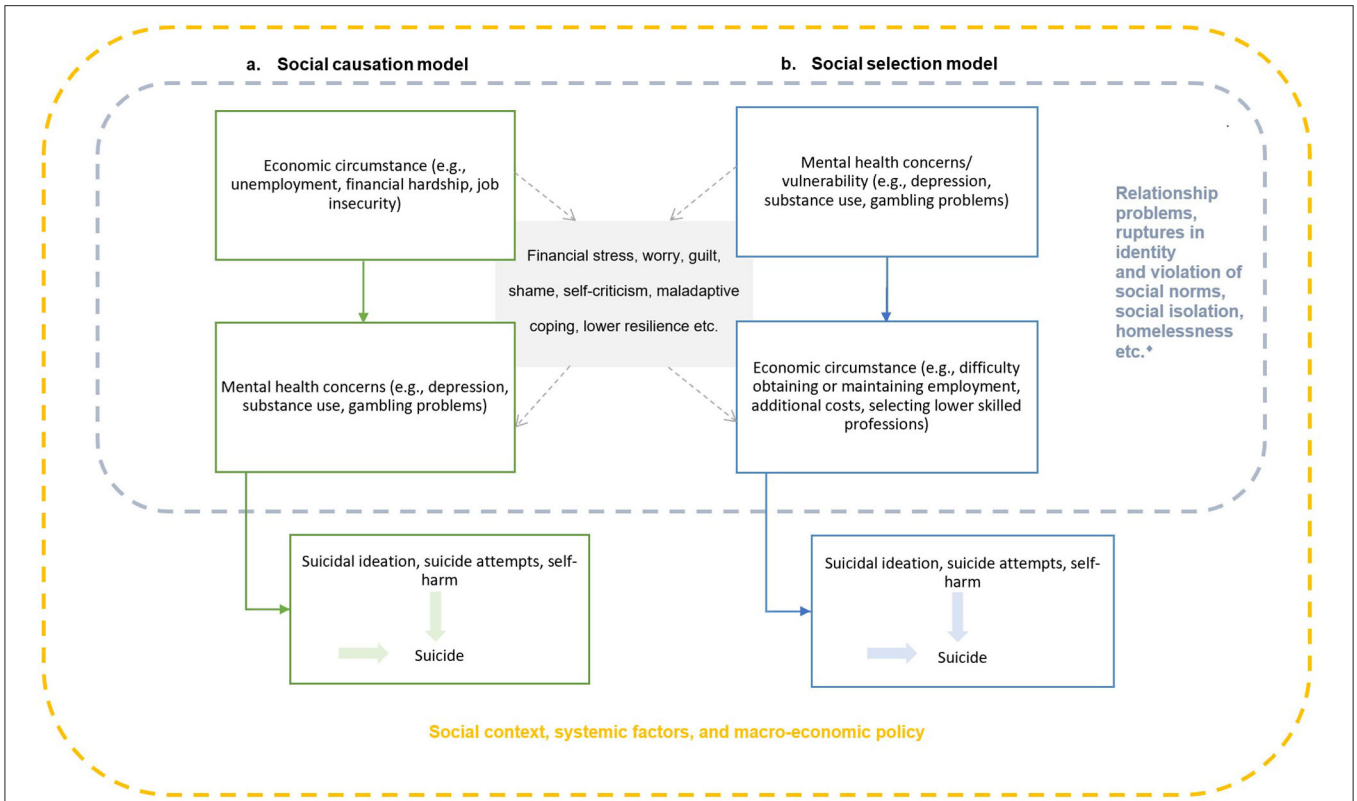

FIGURE 1 | The social causation and social selection theoretical models that account for economic circumstance, mental health, and suicidal behavior. The diamond symbol correlates for suicidal behaviors that may influenced by economic factors and mental health through social causation or selection (may interact differently due to other socio-demographic variables such as gender).

protection, income support, social security, labor market, labor market, upskill*, job upskil*, welfare. Searches were limited to those published from 2010 onwards and in the English language.

Selection and Prioritization of Studies

The primary outcome measure in all peer-reviewed articles was suicidal behaviors and/or ideation. However, for interventions at the individual and aggregate level, secondary outcomes included mental health symptoms and wellbeing. While problematic gambling can be accompanied by significant financial strain (often concealed from, or at the detriment to, close relationships) and is associated with both depressive symptoms and suicidality [e.g., (13–15)], this was considered outside the scope and purpose of the current review. Therefore, any study with a primary focus on the relationship between gambling and suicidal behaviors or ideation and/or interventions addressing problematic gambling to prevent suicidal behaviors or ideation were excluded.

Studies were prioritized if they were a systematic review or meta-analysis. For empirical studies, those that included multiple countries and more than 1 year of data were prioritized, as were population-based data linkage studies, or those which examined novel variables, populations (e.g., low- and middle-income countries; LMICs) or interventions. Each research question is addressed in turn with key findings highlighted alongside supporting in-depth narrative summaries and theoretical synthesis. Given suicidal behaviors and economic factors can be measured at the aggregate level (e.g., suicide rates, unemployment rates, aggregate government expenditure on welfare payments) or individual level (e.g., self-reported suicidal ideation, financial hardship, diagnoses), this is clarified where applicable.

RESULTS

What Is the Role of Economic Factors Such as Un/Underemployment, Financial Hardship, Financial Wellbeing, Job Insecurity, and Economic Crisis on Suicidal Behaviors and Ideation?

Unemployment, Economic Crisis, Recession, and Suicidal Behavior and Ideation

Economic Crisis, Recession, and Unemployment–Aggregate Level

According to Durkheim (16), rapid social changes can cause "anomie" where societal norms are no longer acceptable, or accurately reflective of social reality, which increases the rate of suicides in the society/community (anomic suicides). Luo and colleagues (17) define economic crisis as "the state of affairs broken by sudden and severe economic recession" (p. 1139). The

main characteristics of an economic recession are an increase in unemployment and a drop in gross domestic product (GDP) (17). Suicide mortality at the time of economic recession and crises has been the interest of numerous studies.

A notable body of research in the last decade has focused on the 2008 Global Financial Crisis (GFC), and typically compared the periods before and after the crisis, but also examined the association with unemployment at the time of crisis. A recent systematic review by Frasquilho and colleagues focused on multiple aspects to identify associations between recession, socioeconomic factors and mental health in the literature from 2004 to 2014 (18). Investigating the effects of pre-and post-recession changes in suicidal behaviors, they identified eight aggregate level studies using ecological study designs all focusing on the impact of the GFC. Studies were from Europe and Northern America and all except one analyzed suicide rates. In general, studies showed an increase in suicide rates after recession commencement, particularly for men and among the middle-aged. The only study analyzing suicide attempts, which was from Andalusia, Spain also showed a significant rise in hospital recorded suicide attempts after the recession onset (19).

A good example of a time-trend analysis of the impact of the 2008 GFC on suicide, not included in the above-mentioned review, included 54 countries: 27 in Europe, 18 in the Americas, eight in Asia and one in Africa (20). Their analysis assumed that excess suicides were caused by the onset of the GFC in 2008, therefore, excess suicides in 2009 were calculated using the trend line on 2000-2007 as the basis for expected suicides. They found 5,124 excess suicides for males: the increase was found for males in Europe (4.2%) and in the Americas (6.4%), but not in other (mostly Asian) countries. The largest increase was found for males aged 15–24 years in Europe and aged 45–64 in the Americas. There was no change for females in Europe, and the increase was smaller for females compared to males in the Americas. The authors also indicated that rises were associated with the magnitude of change in unemployment and were more prominent in countries with lower suicide rates before the crisis (20).

The systematic review by Frasquilho et al. (18), noted above, also identified studies analyzing correlations with the macroeconomic factors such as unemployment rate and GDP. They found 16 ecological studies in 2004 to 2014 showing strong associations between unemployment and suicide rates predominantly in European and North American countries covering varying time periods. A study by Norstrom and Gronqvist (21) covered the most countries (30 countries from the EU, North America and Australia) and involved the longest time period (1960-2012). They showed that the association between unemployment and suicide was strongest in the countries which had the least supportive unemployment protection (Eastern and Southern Europe). The association was significant for males in all country groups (grouped by strength of the welfare system) except Scandinavia, but for females it was significant only in Eastern Europe (i.e., lowest levels of protection). The interaction term capturing the possible excess effect of unemployment during the financial crisis was not significant.

Another systematic review covered a time period between 1992 and 2014 and identified 38 studies on the aggregate level focused on analyzing associations between macroeconomic factors (mainly unemployment rate and GDP) and suicide rates (22). They identified 31 studies that found positive associations (i.e., increased unemployment rate, decreased GDP associated with increased suicide rates), two studies that found no association, three that were inconclusive, and two that showed a negative association between economic recession and suicide rate.

A comprehensive analysis (23) aimed to improve understanding of the effect of unemployment on suicide rates by analyzing suicide mortality between 2000 and 2011, including other economic variables such as GDP, growth rate and inflation, using longitudinal modeling. Their methodology allowed for separate estimates to be made of excess suicides due to unemployment and due to the economic crisis (24). The 63 countries analyzed were categorized into four world geographic regions including the Americas, northern and western Europe, southern and eastern Europe and non-Americas and non-Europe. Only unemployment rate was associated with similar effects in the regions analyzed. The best fit model was the non-linear, 6-month time-lagged unemployment rate, displaying similar estimates for each world region. This means that rates of suicide tended to increase 6 months prior to unemployment rates rising, which might indicate the effect of job insecurity and work-related stress on suicide rates. Nevertheless, across all world regions between 2000 and 2011, 20–30% of suicides were related to unemployment. In 2007 and 2009, unemployment was associated with an estimate of 41,148 and 46,131 suicides respectively, suggesting that the recession was responsible for an additional 4,983 (unemployment related) suicides. This means unemployment was responsible for a 9-fold increase in suicides than those attributed to other impacts of the economic crisis, such as inflation (23). However, unemployment does not account for all the effects and impacts of the economic crisis. Recessions can also lead to potential cuts in public funding (i.e., fiscal austerity), inclusive of health care, job insecurity, lower income, debts, and bankruptcies which impact the lives of individuals and their families (24).

A recent international analysis further confirms the association between unemployment and suicide rates. One influential study, with a global coverage of 175 countries between 1991 and 2017, demonstrated a 1% increase in the unemployment rate globally is associated with a rise in male suicide rate by 1% relative to female (25). A stronger association of unemployment and male suicide rates is particularly evident in high income countries (4%). Comparisons by age groups showed that people aged 30–59 years were more impacted whereby a 1% increase in unemployment increased suicide rates by 2–3%. Their further analysis of GDP showed that an increase of the GDP per capita by every US$1,000 was associated with a decline in suicide rate by 2%. Interestingly a country-based analysis did not show any association between the GDP and suicide rate in Australia and the US (25). However, length of unemployment may be an important consideration (26).

In addition to analyzing unemployment rate, GDP per capita, or suicide rates throughout economic cycles, several studies also examined other macro-economic variables such as aggregate consumer behavior. For example, Korhonen et al. (27) created an economic hardship index based on the difference between habitual and actual consumption. Their panel data analysis of 15 OECD countries between 1960 and 2010 showed a relatively strong association between the increase in economic hardship index and increasing suicide rates after controlling for several aggregate level indicators, including the unemployment rate. The authors noted that a hardship index is a better explanatory variable than unemployment rate (27). A more recent Australian study (28) analyzed monthly data of suicide rates, unemployment, and the consumer sentiment index by gender from February 1990 until September 2018. This study is the first to analyze the link between suicide mortality and consumer sentiment (i.e., the perception and expectations of personal and wider economic conditions). Male suicide rates increased with a rise in unemployment rate but declined when consumer sentiment improved. Interestingly, suicide rates did not react to a decline in unemployment and to the worsening of consumer sentiment. The association was the opposite for females, where suicide rates increased significantly when consumer sentiment deteriorated and declined when unemployment rates dropped (28). The authors emphasized that Australian suicide prevention policies should target unemployment and financial problems as important risk factors, with special attention paid to men during major economic recessions.

In general, economic crisis, unemployment rate and other macroeconomic measures are associated with increased risk of suicidal behavior at the aggregated level. However, while ecological studies are useful for understanding changes on the aggregated level and generating hypotheses, there remain questions of causality (direct or indirect), as well as what other potential factors might be involved. Indeed, aggregated level studies are subject to an "ecological fallacy" and cannot explain associations at the individual level. More individual level studies are needed to provide further insight into the link between unemployment, financial problems and suicidal behavior and ideation.

Unemployment-Individual Level

Several systematic literature reviews and meta-analyses have focused on the links between unemployment and suicidal behaviors and ideation at the individual level. A recent meta-analysis examining the association between unemployment and suicidality (including suicide, suicide attempt and suicidal ideation) incorporated results from 54 studies across the world (published before April 2020), although mainly from Western countries, and to a lesser degree Asian and African based studies (29). The results showed a significant association between unemployment and suicide mortality [odds ratio (OR): 1.87, 95%CI: 1.40–2.50], suicide attempts (OR: 1.54, 95%CI: 1.26–1.89), and suicidal ideation (OR: 1.94, 95%CI: 1.61–2.34). However, the review included different study types, making comparisons difficult and thus could only describe associations.

The link between unemployment and suicidal behavior at the individual level is not clearcut. The most appropriate study designs for testing causality are cohort studies, which enable researchers to follow individuals over longer periods of time. Two systematic reviews and meta-analyses have specifically examined the unemployment-suicide relationship utilizing individual-level cohort studies (11, 30). A conceptual review and meta-analysis (11) aimed to add further clarity around social selection and social causation (**Figure 1**). Several of the included cohort studies demonstrated that unemployment is linked to suicide (11). The review (11) showed several cohort studies have tended to make an assumption of "social selection" and indeed their meta-analysis found that after adjusting for other factors such as mental health, the link between unemployment and suicide reduced; however, remained significant (RR: 1.15 95CI: 1.00–1.30). However, if mental disorders are considered as a mediator between unemployment status and suicide (i.e., "social causation"), then adjusting for mental disorders is methodologically flawed and may underestimate the impact of unemployment. A small number of cohort studies analyzing duration of unemployment, have shown that long-term unemployment is associated with a higher risk of suicide compared to short-term unemployment or to employed populations (30). The greatest risk for suicide was found within 5 years of unemployment as presented in another review by Milner and colleagues (30). However, mental health problems are not the only mediating factors; others include financial stress due to loss of income, and changes in health behaviors, among others (12).

It is important to consider that all studies included in the two meta-analyses by Milner et al. (11, 30) came from Scandinavian countries, which have comprehensive social welfare systems and thus there is potential for their support systems to mitigate the effect of short-term unemployment. Therefore, applicability of these results to other countries is debatable. Furthermore, comparisons across the studies are hindered by differences in the definitions of unemployment and suicidal behavior and ideation, study designs and statistical modeling (e.g., method and inclusion of confounding factors).

A more recent meta-analysis of longitudinal studies focused on the link between demographic factors, including employment status (defined by various available factors across studies such as occupation, type of employment, unemployment, skill level etc.), and suicidal behavior and ideation (31). They reported that employment status did increase the risk of suicide (RR: 1.41; 95CI: 1.05–1.90) and suicidal ideation (RR: 1.23; 95CI: 1.02–1.49), but not suicide attempt (OR: 1.12; 95CI: 0.74–1.70). However, their analysis grouped unemployed individuals with people with disabilities; therefore, it is not possible to distinguish the specific effect of unemployment due to economic reasons.

Unfortunately, most systematic reviews focus mainly on Western and high-income countries. One systematic review (32) focused on socio-economic factors and suicide (attempts) in low- and middle-income countries (LMICs) across Asia prior 2013. They identified 12 studies measuring the association between unemployment and suicidal behavior. While most studies did not find any association, three studies (from India, Indonesia, and Pakistan) found that people who died by suicide were more

likely to be unemployed. A more recent large scale cohort study from Sri Lanka (33) also did not identify association between unemployment and suicidal behavior; however, they found that people from lower socioeconomic positions (e.g., daily wage laborers) had higher risk of suicidal behavior.

Gender differences at the individual level were only examined in the meta-analysis by Amiri (29). The findings indicated a significant association between increased odds of suicidality and unemployment in males (OR: 1.97, 95%CI: 1.44–2.70) and females (OR: 1.87, 95%CI: 1.48–2.37) with only a slight difference between sexes (29). For example, a recent study from New Zealand linking Census information of employment with the suicide mortality and hospitalization for intentional self-harm showed, after adjusting for confounders, unemployment was associated with suicide and self-harm similarly for men (adjusted OR: 1.48, 95% CI: 1.20–1.84 and adjusted OR: 1.55, 95% CI: 1.45–1.68, respectively) and women (adjusted OR: 1.39, 95% CI: 1.13–1.37 and adjusted OR: 1.39, 95% CI: 1.13–1.37, respectively) (34). Nevertheless, some recent results contradict these findings. A US study utilizing data from the National Longitudinal Mortality Study including 1.5 million people, identified that sex was a moderator in the association between unemployment (looking for work) and suicide (35). More specifically, the association was stronger for women (adjusted RR: 2.99, 95% CI: 2.05–4.37) compared to men (adjusted RR: 1.39, 95% CI: 1.13–1.37) after adjusting for demographic variables. An Australian study, utilizing the National Coroner's Information System, showed that unemployed/economically inactive males had over four times the risk of suicide compared to the employed, which was over eight times the risk for females (36). However, a further analysis of the potential impact of the GFC on suicide showed a significant increase in suicides in economically inactive/unemployed males (22% in 2008, $p < 0.001$) and females (12% in 2007, $p < 0.001$). Nevertheless, suicide also increased among economically active males (7% rise in 2007 $p = 0.003$), but not among employed females.

Financial Problems and Suicidality

Economic problems such as unemployment and underemployment are highly interrelated with financial problems such as debt and financial strain. It cannot be assumed that just one in isolation leads to suicidality, but rather a combination is likely. There are further complexities when considering the issue of definitions and terminology. French and Vigne (37) define "*financial strain* as anxiety, worry or feelings of not coping created by economic or financial events. This condition is therefore synonymous with 'financial/economic hardship,' 'financial/economic stress,' 'financial difficulties' or 'inability to cope financially.' We regard economic problems such as unemployment, poverty, arrears, debt or even over-indebtedness as necessary but insufficient explanatory factors for financial strain." (p. 150). Although there are some aggregate level studies [e.g., (27, 38)] showing a link between economic hardship based on consumption and suicide, the majority of research analyzes individual level links.

A systematic review and meta-analysis (39) examined unsecured debt (e.g., credit) and suicide across nine studies, and found a significant association between debt and suicide (OR: 7.9, 95% CI: 5.21–12.0) and suicidal behaviors (pooled OR: 5.76, 95% CI: 2.97–11.18). Another systematic review focusing on indebtedness and its health impacts referred to five studies analyzing debt and suicidality and concluded that people with unmet loan payments were more likely to experience suicidal ideation (40). Interestingly, a US study found that people who were admitted to the trauma center with a suicide attempt had significantly higher odds for becoming bankrupt in the following 2 years compared to those admitted with an accident, after adjusting for several confounders (OR: 2.10, 95% CI: 1.29–3.42) (41). This finding was stronger for females. Odds of personal bankruptcy in the 2 years before a suicide attempt were somewhat weaker (OR: 1.68, 95% CI: 1.06–2.67). The results revealed that filing for bankruptcy is not an isolated event and does not reflect the end or the beginning of financial hardship and suicidality (41).

Other studies further show the interrelatedness of financial problems with unemployment and other factors. For example, in a recent US cohort study Elbogen et al. (42) found that cumulative financial strain, which encompassed financial debt/crisis, unemployment, past homelessness, and low-income, was predictive of suicide attempts (OR: 1.53, 95% CI: 1.32–1.77) and suicidal ideation (OR: 1.44, 95% CI: 1.33–1.55) between Waves 1 (2001–2002) and 2 (2004–2005) after controlling for demographic and clinical covariates. Moreover, when examining these factors independently, at Wave 1 financial debt/crisis and unemployment were predictive of suicide attempts and suicidal ideation between the two waves (42).

Recent studies analyzing various aspects of financial strain in South Korea utilized the Korean Welfare Panel Study with over 10,000 participants. Kim and You (43) analyzed late bill payments and after adjusting for sociodemographic variables and self-reported depressive symptoms, suicide attempts were significantly and positively associated with overdue payments. More specifically, people with late bill payments had increased odds of suicide attempts rising with the number of late payments (one - OR: 5.46; 95% CI: 1.82–16.39, two or more–OR: 7.44 95% CI: 2.89–19.20) compared with those without late payments (43). Furthermore, having one late payment was not significantly associated with suicidal ideation, but having two or more late payments increased the odds of suicidal ideation significantly (OR: 2.11, 95% CI: 1.22–3.65) (43). Another analysis examined seven waves from the same dataset (44). Financial hardship was measured as a composite of multiple questions (including difficulties in paying for rent, utilities, healthy food, use of medical services, and other credit problems) and change over time, and was categorized as no hardship, resolved, emergent and persistent over 2 years (44). The results showed a significant association between financial hardship and suicidal ideation. In particular, after adjusting for confounding factors, emergent and persistent hardship were each associated with suicidal ideation for both genders and all age groups. Additionally, for resolved hardships, the association with suicidal ideation was still significant for men and women aged 65 years and older (44).

COVID-19 Pandemic, Economic Factors, and Suicidality

The COVID-19 pandemic has led to increased unemployment, financial strain, and economic downturn. Indeed, financial insecurity as measured by a variety of indices (e.g., market volatility, subjective uncertainty, forecaster disagreement etc.) has peaked rapidly at unprecedented rates (45). These economic circumstances may further lead to a rise of mental health problems and suicidal behavior (46). At the early stages of the pandemic, several expert opinion pieces (47–49) and predictions emerged (50). All refer to the potential impact of economic conditions on the aggregate and individual level, which are likely to lead to an increase in suicidal behavior and ideation. An ecological study investigated the expected effects of the COVID-19 related economic turmoil by modeling predicted suicide rates in 38 OECD countries in 2000-2017, to examine the association with unemployment (46). The results suggested that unemployment was significantly associated with higher suicide rates in men aged 15–64 years, particularly for men aged 40–64 years. This relationship was much weaker for women, with the unemployment-suicide relationship significant for girls and women aged 15–24 and 35–74 only (46). However, despite the authors' noting the relevance of their modeling in the context of the COVID-19 pandemic, they did not make any attempt to predict future changes in suicide rates. McIntyre and Lee (50) did attempt to make predictions in a Canadian study by analyzing different scenarios in relation to the change of unemployment. However, this approach is fraught with methodological challenges, considering the multiple factors impacting suicidal behaviors, with some potentially having a protective effect at the time of crisis (e.g., togetherness, resilience, and others) (51). Indeed, in the early stage of the pandemic suicide rates have not increased (52, 53).

A few longitudinal studies have also analyzed economic stressors at the time of COVID-19 and suicidal thoughts. For example, a Canadian repeated cross-sectional study investigated the prevalence of self-reported suicidal ideation in a nationally representative sample during the COVID-19 pandemic at three time periods between 2020 and 2021 (54). The results indicated the prevalence of suicidal ideation is increasing over the course of the pandemic. Analysis of COVID-19 related concerns showed that after adjustment for sociodemographic factors, individuals who were experiencing financial stressors, such as concerns about debt and paying bills, had increased risk of suicidal ideation (OR: 2.48, 95% CI: 1.97–3.13). Furthermore, worries about job loss were also associated with increased odds of suicidal ideation (OR: 2.61, 95% CI: 2.07–3.29) (54). A longitudinal online study from the UK over two timepoints in May and September 2020, examined whether COVID-19 related financial stress and social isolation were associated with suicidal ideation and behavior in a small sample ($n = 370$) (55). Financial stress deemed by the respondent as COVID-19 related at time point 1 was significantly associated with suicidal ideation and behavior at time 2, ($p = 0.01$). Depression and loneliness were also found to significantly mediate the relationship between financial stress and suicidal ideation and behavior at time point 2 (55).

As the impact of the COVID-19 pandemic continues to unfold, it is important that ongoing and high-quality surveillance of suicidal behavior and ideation continues (52). This is critical for determining the overall impact of COVID-19 on suicidal behaviors, and in particular, the economic impact of such an unprecedented pandemic on a global scale. Based upon the literature in this review it appears that suicide rates have not increased in the early stages of the pandemic, and may in fact, have decreased (52). However, it does appear that financial concerns attributed to the pandemic may contribute to later suicidal ideation and distress which may have an ongoing impact on suicidal behaviors in the future.

What Available Evidence Is There for the Effectiveness of Interventions Addressing Economic Factors in Reducing Suicidal Behaviors and?

The Protective Role of Policy and Government-Based Interventions

Government policies and expenditure directed toward mitigating the impact of harmful economic circumstances (e.g., unemployment) may not be traditionally regarded as suicide prevention interventions. However, given the associations described above and important theoretical conceptualizations it is conceivable that such activities may reduce suicidal behaviors and ideation, as well as improve overall mental health and wellbeing (7, 8, 56). A recent systematic literature review of studies published until October 2018 sought to determine whether government level responses to economic factors ameliorated the relationship between unemployment and suicide (57). Only six ecological studies examining unemployment policy (e.g., benefits, protection legislation) on suicide rates were identified. Each study spanned several years and multiple high-income countries/states. Overall, the authors concluded there was evidence to suggest government unemployment supports were associated with a reduction in suicide rates (57). This has important implications for suicide prevention. For example, two of the included studies (58, 59) examined the impact of active labor market programs (ALMPS) across an overlapping cross-national sample in the European Union. ALMPS are defined by the Organization for Economic Co-operation and Development (OECD) as all social expenditure, besides education, with the intent of improving chances of gainful employment or an increase in earning capacity (60). Both studies found that for every increase in unit of spending on ALMPs there was an associated decrease in suicides (albeit only small 0.026–0.038%). However, neither study found any mitigating impact of employment benefit payments by either total aggregate spending (59) or income replacement per unemployed person (58). In contrast, three further studies identified in the review found higher unemployment benefits were associated with significant decreases in suicide rates (61), particularly in men (21, 62). Fiscal austerity and *reduced* government spending was associated with a short (1.38%), medium (2.42%), and long-term (3.32%) rise in suicide rates in older aged men (62). In these studies, the operationalization of employment benefits was more

encompassing and attempted to capture overall "generosity" of benefit. For instance, maximum rate multiplied by maximum duration of eligibility (61), gross replacement rate (62), as well as the incorporation of other characteristics such as wait times and qualifying conditions (21). The final study included in the review included high income countries within the OECD (18 European countries, Japan, and Republic of Korea) across 1994 to 2010 (63). This study investigated the impact of employment protection legislation (against unfair dismissal) in *younger* adults (25–34 years) and found that for those with regular work contracts there was a significant protective effect of legislation regardless of sex, whereas for temporary workers effects were only observed in men aged 30–34 years of age. This was also found in older aged men (62). Overall, the systematic review (57) noted that further research was needed and would benefit from more rigorous testing (e.g., cohort designs), to investigate impacts at the individual level (e.g., qualitative designs), as well as to evaluate the possible impact on suicide attempts or self-harm.

More recently, several studies published after the systematic review (57), have also investigated the impact of government-based interventions and overall suicide rates. A recent ecological study in Italy examined the relationship between rates of unemployment and suicide in men and women separately from 1990 to 2014, with a focus on the recession, and investigated whether ALMPs moderated this relationship (64). Average ALMP spending per head did appear to moderate the unemployment-suicide relationship in men aged 45–54 who were in a central region in Italy, whereby a 1% increase in ALMP spending was correlated with a 0.45% decrease in suicide rates among men in this subgroup (64). No significant impact was noted for women in this age group and region, or for people in any other age groups located in or outside of central Italy (64). The authors suggest that a lack of adequate funding may have influenced the absence of widespread findings across subgroups, as spending was far below minimums reported in other studies [US$125 per head in the current study vs. US$190 suggested by (59)].

Regarding the *accessibility* of unemployment benefits/insurance, rates of insurance recipiency (as a measure of eligibility and implementation, not total benefit spending ratio or benefit duration) were deemed potentially protective at a population level for those with highest rates of suicide such as men and those aged 45–64 years in all states of the US from 2000 to 2015 although findings were not significant (65). In another US study, an increase in the mandated minimum wage by US$1 reduced suicide by 6% in those with low education (aged 18–64) whereas there was no impact for those with college degrees even when adjusting for age, gender and ethnicity, using data from all states in USA (1990–1995) (66). This relationship was stronger in periods of high unemployment and attenuated in periods of low unemployment, with the authors concluding that policies aiming to improve economic circumstance of those in lower socioeconomic positions in particular, can have a protective effect on suicide (66).

It appears that despite the well-established connection between economic factors and recession with suicidal behaviors, there is a comparatively small body of research investigating the protective role of government policy interventions with regards to suicide prevention, especially when considering suicide attempts, self-harm, and suicidal ideation. However, as noted by Shand et al. (57) suicide is an "extreme" outcome from unemployment. Other literature reviews have noted the beneficial impact of ALMP initiatives and benefit payments/social protection spending on physical and mental wellbeing, including depressive symptoms [see (67, 68) for review]. Unfortunately, this may be less protective than actual employment for men (69) or for those with insecure jobs (70). In contrast to suicidal behaviors, these findings for mental wellbeing were demonstrated mostly at the individual level (e.g., self-reported symptoms of depression, anxiety, or poor wellbeing).

Furthermore, given the complex and compounding associations with other prominent risk factors for suicidal behaviors, and the likely co-occurring role of social causation and social selection described earlier, it has been suggested that government policies to minimize the harmful effects of alcohol and other drugs, reduce homelessness, promote social inclusion, facilitate equitable access to primary (mental) health care, support low-income families, and encourage the responsible media reporting of suicidal behaviors [see (7, 8)], may be additional (and often established) primary preventative measures that may also ameliorate the association between economic factors and suicide. According to social causation, addressing economic factors has the potential of reducing mental health difficulties and by extension suicidal behaviors, and according to social selection, may prevent an intensification of already present risk factors for suicidal behaviors. Given these models' likely overlap (7) it appears policy level interventions may be beneficial in protecting against suicidal behaviors and distress; however, more research is required.

Individual Level Interventions Addressing Employment and Personal Financial Circumstances

In addition to government policies, there is the potential to provide tailored interventions for economic advice and assistance that may aid in the prevention of suicidal behaviors at the individual level. Research, however, is sorely lacking. A small-scale feasibility study of a randomized control trial in the UK used a mixed methods design to examine the feasibility and acceptability of an intervention (Help for People with money, employment, or housing problems "HOPE" service) (71). The intervention provided psychosocial support for individuals who presented to the emergency department following self-harm or acute distress due to (accumulating) employment, financial, or welfare issues (71). The novel and assertive intervention was developed in recognition of the vast difficulties people have in navigating the employment benefits and social welfare system, application processes, delays, and meeting eligibility requirements. Even though these policies and benefits are designed to assist, the administrative processes have been cited as a source of huge stress in the lead up to self-harm emergency presentations, among others (72, 73). In the intervention group ($n = 13$), participants received a series of one-on-one tailored financial assistance sessions (e.g., interpretation of official documentation, benefits advice, connection with community resources and mental health care) supplemented

with motivational interviewing designed to resolve ambivalence, boost independence, decision-making skills, and confidence when addressing their financial problems. Sessions were mainly conducted in the home, however, also involved travel to debt advice agencies. In the control group ($n = 9$), participants were signposted to support organizations. Qualitative feedback from participants ($n = 19$ randomized 2:1) and workers providing the intervention suggest there was benefit to the program, including assistance with resolving financial difficulties (71). However, being a feasibility trial, it is necessary for future research to determine actual effectiveness of the intervention as compared to the control group.

Given a lack of information on suicidal behaviors, we broadened our focus to examine literature that has investigated financially focused interventions that aim to improve mental health and wellbeing. A recent systematic review of community interventions (68) examined the effectiveness of interventions aimed at acute financial uncertainty, such as financial strain, job loss, and debt, in improving mental health outcomes. Searches concluded in August 2019 and studies were included if they reported mental health outcomes in working age adults (18–64 years) in high income countries and used experimental, quasi-experimental or observational designs. A total of 15 studies met the inclusion criteria. Two studies evaluated telephone debt advice interventions (74, 75). One study in the UK found no significant changes in anxiety at the 20 week follow up, and due to a high attrition rate, the 12-month follow up was not completed (74). The second study in the US found only small improvements in overall health, which included stress, however mental health was not assessed independently (75). A further seven studies examined the effectiveness of welfare advice services co-located within healthcare settings and found mixed results. One examined food insecurity interventions (e.g., food banks), and two examined gatekeeper signposting and referring to community supports (68). Overall, the authors noted that review findings were limited by poor quality design (e.g., small, uncontrolled studies), yet interventions appeared useful in improving financial distress. However, it was not clear as to the effectiveness on mental health outcomes (68).

An earlier systematic literature review focused exclusively on randomized control trials investigating interventions targeting debt and unemployment, including debt advice, gatekeeper training, job skills training and others (76). Studies were excluded if participants had serious mental illness, were not of working age, were part of a specific group (e.g., single mothers), or were focused on rehabilitation into the workforce for those with serious physical or mental health problems. Despite overlap in the search period, only two studies overlapped with the previous review by McGrath et al. (68) (one assessing debt advice hotline, and one assessing a group job skills training intervention). This review found, based on multiple trials, intensive 1-to-2-week job skills and self-efficacy training ("job clubs") were effective in reducing depression for up to 2 years. However, results were less clear for unemployment. Furthermore, cognitive-behavioral therapy for long-term unemployed people and those in lower socioeconomic groups were effective in reducing symptoms of depression and improving re-employment. In this review, only one study was identified that examined the effectiveness of a debt advice hotline [overlapping with (68)] as well as one trial each for various other psychological interventions (e.g., imagery, journaling) and thus evidence was deemed limited for these approaches (76). Unfortunately, this review was limited by its strict exclusion criteria which meant that studies did not include participants who may be at particular risk of unemployment of financial hardship and also suicide (76).

Altogether, these reviews demonstrate the effectiveness of financial and employment-based interventions on reducing mental health symptoms, particularly depressive symptoms. Given associations between mental health and suicidal behaviors this could have implications for suicide prevention (76). These reviews provide inconclusive evidence as to the effectiveness of debt advice interventions (e.g., helplines) and trials had difficulties with recruitment and attrition overall.

Interventions Implemented During and in Response to COVID-19

There has been considerable and well justified concern regarding the unfolding impact of the COVID-19 pandemic on both suicidal behaviors and economic crisis, including unemployment. As a result, governments around the world have introduced unprecedented social welfare packages. As described earlier, policy-based employment interventions may have beneficial outcomes on suicide rates, including during periods of economic recession; however, this is not clear for suicide attempts and self-harm (57). Furthermore, most evidence across both levels were for ALMPs and employment focused interventions or policies which do not apply to the COVID-19 pandemic where whole industries were affected (e.g., "gig" economy, hospitality, tourism, transport) and opportunities for (re)employment were necessarily limited due to health restrictions. Therefore, government activities have included raising expenditure on employment benefits among other stimulus measures. As described earlier, overall generosity of benefits has been linked to reduced suicide at the aggregate level (57) and it remains to be seen what impact this has on other suicidal behaviors and at the individual level. Nevertheless, suicide rates did not rise in the initial stages of the COVID-19 pandemic (52), and employment benefits and social welfare payments (among others) have been theorized as possibly underlying mechanisms explaining this finding (77). Recent research examined data derived from helpline calls in 19 countries, focusing on the first and subsequent waves of the COVID-19 pandemic. The relationship between call types, income support offered, and the lockdown policies in place in specific countries were investigated (78). Overall, the results suggested that helpline calls increased and peaked 6 weeks after the start of the pandemic, with an increase in calls related to fear and loneliness. However, there was a decline in calls related to suicidal ideation. The latter may have been attributed to a shift of focus to the concern of others, or their fears of COVID-19 infection (78). Measured by an income support index, data from two of the largest helpline samples in France and Germany were further analyzed. Results indicated an increase in infection

rates and more generous income support were significantly associated with a lower number of suicide-related calls in France ($p = 0.004$) and Germany ($p < 0.001$) and it was suggested that for individuals affected economically by the pandemic, the income support provided may have helped to reduce mental distress. However, there is a need for ongoing research to provide a deeper understanding of financially focused intervention or policy during COVID-19 at the individual level.

DISCUSSION

This review sought to synthesize recently (since 2010) published information on the role of economic factors at the individual and aggregate level, including un/underemployment, financial hardship, job insecurity and economic recession on suicidal behaviors and ideation, as well as the effectiveness of interventions addressing these factors on reducing suicidal behaviors. The impact of COVID-19 was highlighted where available.

Based upon the current review and previous others (7–9, 11, 30), it is clear that periods of economic recession and unemployment are associated with an increased risk of suicidal behavior at the aggregate and individual level. Furthermore, financial problems such as debt and financial strain are associated with an increased risk of suicidal behavior and ideation at the individual level. While these relationships are complex and the directionality of association is not clear cut, the (interrelated and overlapping) concepts of social selection and social causation provide two theoretical frameworks for how socioeconomic circumstances may influence or be influenced by mental health and contribute to risk for suicidal behavior and ideation (see **Figure 1**). Furthermore, several prominent theories have attempted to determine the genesis of an individual's suicidal ideation and the mechanisms or constructs underlying the transition from ideation to intent, and ultimately, to self-harm or suicide (79–81). As depicted in our figure, economic circumstances (at the individual and aggregate level) likely influence and are influenced by these mechanisms, such as mental health, social isolation, and connectedness (80, 81). For example, in the integrated motivational-volitional model of suicidal behavior (79), economic disadvantage and recession are acknowledged as important contextual events in the pre-motivational phase of suicidal behavior. However, future research is warranted to determine how further aspects of financial hardship relate to defeat, humiliation, and entrapment as well as socially prescribed perfectionism and negative social comparison, all of which are central to the motivational phase and emergence of suicidal ideation (79).

It is presently unclear what impact economic factors, during or as a result of the COVID-19 pandemic, may have on suicidal behavior and ideation. Nevertheless, it appears that suicide rates have not increased in the early stages of the global pandemic (52). A reduction in suicides in the initial period following large scale disasters is often referred to as the "honeymoon" period where individuals and communities as brought together by their experience of the disaster, and this has been linked to the COVID-19 pandemic (77). Given most data so far was from earlier stages of the pandemic and economic fallout continues to unfold, there is an important need for ongoing research. Especially as people return to work, leaving others behind (26), and as countries reduce their employment benefits to pre-pandemic levels (52, 77).

This review also highlights that unemployment benefits, employment protection legislation, minimum wage and active labor market programs may reduce suicide at the population level, particularly for men [see (57)]. However, the research is somewhat limited and mixed, and it is not clear what impact they have at the individual level. Further, there were no identified studies or reviews investigating outcomes directly in relation to suicide attempts, self-harm, or suicidal ideation. Studies were largely ecological as this type of policy level intervention does not lend itself easily to more robust research designs and is limited to the aggregate level. Overall, more research is required, particularly in relation to individual level outcomes, and the cost-effectiveness of such policy interventions. There was also a lack of evidence as to the effectiveness of tailored financial focused suicide prevention interventions at either the individual or aggregate level. However, there was some evidence that these interventions (e.g., "job club" groups) may improve depressive symptoms over time, which could have implications for suicide prevention by extension [see (76)]. This general lack of research extends to effectiveness of interventions during the COVID-19 pandemic, and various complicating factors make conclusions difficult at this time. Nevertheless, expert opinion and discussion (52, 77) suggests the unprecedented social welfare measures implemented by governments internationally may have had a protective effect against suicidal behaviors.

The complex web of associations between economic factors and other prominent risk factors for suicidal behaviors and ideation (e.g., mental health, substance use) warrants establishing or enhancing responsive, effective, and compassionate interventions that are equitable and accessible in addressing these factors at the individual and aggregate level [e.g., (7)]. Based upon the findings of the current review several recommendations can be made that may serve to mitigate risk at the aggregate and individual level as per the (overlapping) social selection and social causation models, although it is important to be mindful of the methodological issues with existing research regarding causality and endogeneity. For example, higher and more generous welfare payments (i.e., accessible, timely) should be established or maintained as they may have a protective effect against suicide at the aggregate level (8, 57), particularly for those in more vulnerable or at-risk groups (e.g., lower education, youth, men during periods of low unemployment, those with unstable housing, vulnerable industries). This may also be particularly relevant during periods of economic crisis and recession, where the complex and accumulative impact of financial stress in contributing to mental health problems and suicidal behaviors may in turn create a demand on health and mental health services which would be under resourced in times of reduced government spending and have disproportionate impact on those in worse economic positions during the recession (8). Cross-sectoral collaboration

may be particularly important in developing suicide prevention policies that adequately and equitably address issues of mental health and substance use, as well as issues of economic factors and social welfare, housing etc. Additionally, the development and evaluation of individual level support services based on promising evidence from small-scale international studies [e.g., HOPE; (71)] should be considered. However, people with lived and living experience of suicide and financial hardship (unemployment, debt, recipient of benefits) should engage in co-designing these interventions to maximize motivation (and minimize attrition). It may also be important that staff working in employment, welfare, or other socioeconomic institutions (e.g., banks) receive regular suicide prevention training (8). Ideally, these programs would also be co-designed collaboratively with those who have lived and living experience of suicidality and financial hardship, and would be accredited per national standards. These programs must also be designed to achieve certain core competencies published in the literature and be evidence-informed (82). Finally, promoting awareness of free financial services (e.g., financial counseling, debt, and gambling helplines, online "self-help" resources) may increase general levels of financial literacy and connect individuals with supports within the community to respond quickly to personal economic hardship before problems escalate, and may be particularly useful as an early intervention (e.g., for young people). Indeed, future research would benefit from investigating the protective role of financial literacy and financial wellbeing, financial resilience, and/or financial self-efficacy on suicidal behaviors and ideation.

Methodological Considerations

There are several points to consider when interpreting the findings from this review. Studies displayed substantial variability in the different time frames examined and the definitions or operationalization of economic constructs used (e.g., unemployment, underemployment, financial hardship), with several studies not providing a definition at all. This poses a challenge to integrating and generalizing findings. Nevertheless, the current review provides an overview of the current state of the field and identifies potential areas where more research is needed, particularly in relation to interventions at the population and individual level and advancing theoretical understandings with relation to non-fatal suicidal behaviors and ideation. Furthermore, it is likely that there may be some publication bias across studies, particularly at the ecological level, whereby those that found an association may have been more likely to be published. There was also an overall lack of research identified from low-and-middle income countries (LMIC). This is important as the majority of the world's population reside in these countries, which is also where the vast majority of global suicides occur (1). There are likely differences in the societal and cultural impact of economic factors (e.g., unemployment) on suicidal behaviors, as well as variation in the needs and capacity of governments and organizations in responding to these impacts. The few systematic reviews and cohort studies in LMICs across Asia (32, 33) suggest the associations between unemployment and suicidal behavior are less clear cut.

As may be expected, there was also a lack of research investigating interventions and protective factors aimed at addressing economic circumstances and suicidal behaviors and ideation. Of the studies that were identified, many were of low quality or small sample size and had issues with attrition/drop-out. This is important as the high dropout rates may suggest these types of financially focused interventions are not acceptable to financially stressed individuals. For example, it may be that interventions based on providing information do not account for the complex interrelated and intersecting difficulties that serve as reinforcing barriers. Alternatively, perhaps financial stress, and related circumstances, makes it more difficult for people to engage in interventions. Therefore, interventions such as HOPE (71) may be useful in attempting to provide additional motivational or psychological components. Based on the available evidence it is not possible to know at this stage. This lack of research was most noted at the individual level. There is a need for more studies that examine the impact of individual and modifiable protective factors on suicidal behaviors and ideation (e.g., financial wellbeing, resilience), including in situations of long-term unemployment or economic recession.

Strengths and Limitations of the Current Review

Given our review focuses on various types of economic factors (recession, unemployment, underemployment, financial strain, debt, etc.) across the spectrum of suicidal behaviors, and across multiple levels, there was an imbalance in the extent of literature available for each. Therefore, we conducted a selective review to integrate information across fields of research and practice to provide fresh insight into the role of economic factors on suicidal behaviors and ideation, and possible effective interventions. This approach may have introduced some bias into findings. Nevertheless, we did focus on synthesizing information from systematic reviews and meta-analyses, high-quality cohort studies, or studies utilizing multiple years and countries. Findings were also discussed in relation to prominent theoretical models. Incorporating economic circumstances and traditional social theories (**Figure 1**) into individual level theoretical conceptualizations of suicidal behaviors and ideation (79–81) promotes greater understanding of suicidality from different perspectives (psychiatric, public health, economic disadvantage). This will facilitate and provide directions for a more streamlined approach to prevention opportunities.

CONCLUSION

This review examined the role or association between economic factors (unemployment, financial hardship, job insecurity etc.) and suicidal behaviors and ideation. The review also examined the effectiveness of interventions at the government and individual level. Findings confirmed that economic circumstances are an important determinant of suicidal behaviors. Altogether, there was a comparatively smaller body of research examining the protective impact of government

level policies and individual focused interventions on suicidal behaviors and ideation. However, it appears that policy level interventions aimed at alleviating financial stress during periods of increased unemployment may be beneficial in preventing suicide at the aggregate level, although based on existing study designs causality is difficult to determine. Our recommendations for future research to co-develop and evaluate new financial services with respect to impact on suicidal behaviors and ideation, evaluate the impact and cost-effectiveness of existing services and policy level interventions, as well as better determine the role of economic circumstances in relation to theoretical conceptualizations such as ideation to action frameworks and in **Figure 1** will ensure a clearer understanding of the role of economic factors on fatal and non-fatal suicidal behaviors and ideation and assist in guiding the development of effective targeted interventions at both the individual and government level.

AUTHOR CONTRIBUTIONS

Conceptualization: KK, SM, VR, and JH. Data curation and formal analysis-synthesis of results: AT, SM, and KK. Funding acquisition: KK, SM, and VR. Supervision: KK. Writing–original draft: SM and KK. Writing–review and editing: JH, VR, and AT. All authors contributed to the article and approved the submitted version.

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A Standard Protocol for the Clinical Management of Suicidal Thoughts and Behavior: Implications for the Suicide Prevention Narrative

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The last several decades have witnessed growing and converging evidence from randomized controlled trials (RCT's) that an identifiable set of simple clinical management strategies are effective for those at risk for suicidal thinking and/or suicide attempts. The current article offers a brief review of clinical strategies supported by RCT's targeting suicidality as "commonalities of treatments that work" and related recommendations for use in the delivery of care for suicidal individuals in generic fashion, regardless of any particular treatment, theoretical orientation, or intervention perspective. The article includes eight recommendations that can be easily adapted across the full range of clinical contexts, institutional settings, and delivery systems, recommendations that help frame a broader clinical narrative for suicide prevention. Recommendations cut across five identifiable domains or clinical strategies for the delivery of care: (1) informed consent discussion that identifies risks of opting out of care and emphasizes the importance of shared responsibility and a collaborative process, (2) an explanatory model that emphasizes the importance of individual self-management skills and targeting the causes of suicide rather than describing suicidality as a function of mental illness, (3) the importance of proactively identifying barriers to care and engaging in targeted problem-solving to facilitate treatment adherence, (4) a proactive and specific plan for management of future suicidal episodes, and (5) reinforcing the importance of taking steps to safeguard lethal means and facilitate safe storage of firearms.

Keywords: suicide, randomized controlled trials, standard protocol, treatment, public health narrative, risk assessment

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INTRODUCTION

Over the past several decades, suicide-related research and, of particular importance, randomized controlled trials (RCT's) from across the globe targeting the treatment and reduction of suicidal thinking and suicide attempts have expanded markedly (1–3), creating an important resource to inform day-to-day clinical care. Results from RCT's provide a unique opportunity to identify what works with individuals who are suicidal in samples representing a broad range of Axis I-II diagnoses with considerable comorbidity, and what has potential for wider clinical application. Risk of death from suicide is similar to the risks inherent in other medical problems, for example,

cardiac death or cancer malignancy. Essential to effective treatment is identifying and targeting the underlying causes. RCT's provide scientific support for treatment approaches that do just that, effectively identify and treat the underlying causes of suicidal thinking and behavior, independent of the specific psychiatric diagnosis(es) (4).

Jobes and Chalker (5) recently argued that there is a growing body of empirical research to support targeted interventions for those at risk for suicide. But these authors caution that such efforts should be sensitive to the broad array of existing theoretical orientations, different clinical perspectives, and various treatment contexts and settings. Accordingly, they stress the need for a greater focus on clinical interventions and treatments that are optimally matched to identified subgroups of those experiencing suicidal thoughts and engaging in suicidal behaviors.

This article takes another step forward in the evaluation, distillation, and application of available scientific findings. As a complement to meta-analytic studies (2, 3), Rudd and Perez-Munoz (4) identified "commonalities of treatments/clinical interventions that work," providing a review of common elements in effective RCT's to date, but fell short of offering specific recommendations for clinical practice. Commonalities were identified by a review and analysis of the treatment/intervention components articulated by the authors of each empirically supported and effective RCT. In short, each RCT identified the mechanisms of action for the targeted treatment/intervention. The points of intersection and overlap of those elements were identified across all RCT's demonstrated to be effective at reducing suicidal thoughts and/or attempts. Rudd and Perez-Munoz (4) provide a detailed review and list of all RCT's reviewed (in an expansive table), including study inclusion/exclusion criteria, interventions/treatments tested, follow-up period, outcomes, and significance of subsequent impact. The reader is referred to the table for the specific listing of RCT's reviewed and specific examples across each domain summarized below. For The current article offers an important extension of this work, providing actionable clinical recommendations for day to day delivery of services with suicidal individuals.

In contrast to previous contributions, like the recommendations offered by the National Action Alliance for Suicide Prevention Zero Suicide Model (6) or the Suicide Prevention Australia Standards for Quality Improvement (7), we focus specifically on the scientific foundation for clinical care created by RCT's targeting suicidal ideation and behaviors. Accordingly, we offer recommendations regarding the use of simple and effective clinical strategies that can be applied in flexible fashion, regardless of a particular treatment orientation, perspective, or clinical context. These recommendations provide a specific and important empirically supported foundation for clinical practice, regardless of context, one that will hopefully facilitate scientific inquiry essential to clinical practice. Progress in clinical suicidology and subsequent translation to clinical practice is incremental. The integration of proven clinical strategies across clinical contexts will help move that incremental process forward. Additionally, the identified clinical strategies can be used as foundational elements to help shape and inform clinical suicide prevention narratives. The current public health approach is, arguably, disproportionately focused on screening and related risk assessment rather than effective intervention, treatment, and ongoing clinical management of suicide risk.

There is a growing convergence of empirical evidence from RCT's supporting the effectiveness and use of a limited collection of clinical management strategies with patients who are suicidal, cutting across a broad range of Axis I-II diagnoses with considerable comorbidity (4, 8). Our identified strategies are thus trans-diagnostic and are neither theoretically bound nor clinical-context dependent (i.e., inpatient, outpatient, residential, intensive outpatient, primary care, or emergency department). As a result, the strategies can be integrated into the delivery of effective clinical care regardless of the clinician's particular theoretical orientation, existing practice approach, treatment timeframe, or treatment setting. These strategies can be organized into a standard clinical management protocol appropriate for broad application, building on the substantive work aggregated by the Suicide Prevention Resource Center (SPRC). Naturally, there is some variability in how strategies might be applied in clinical specialty settings in comparison to, for example, primary care or an emergency department. As Rudd and Munoz-Perez (4) noted, these clinical strategies can most accurately be described as identifiable "commonalities of treatments that work" with individuals who are suicidal. Although each of these strategies has strong empirical support and are in active clinical use across a wide array of settings, to date these strategies have not been organized and integrated into a standard, generic clinical management protocol. Moreover, these findings have yet to be strategically leveraged to help shape narratives focusing on clinical suicide prevention policy and procedures.

A standard clinical management protocol equips the practicing clinician with a solid scientific foundation and framework for working with patients who are suicidal, utilizing strategies demonstrated to be safe and improve clinical outcomes, including reductions in both suicidal thinking and suicide attempts. It is important to emphasize that each of the strategies are conceptualized as interventions requiring action on the part of the clinician, and not simple guiding or underlying principles. In short, the clinician is actively engaged in delivery of the elements summarized in each domain. Available RCT evidence to date supports clinical recommendations that cut across five critical domains: (1) an informed consent process and initial dialogue with people who are suicidal that shares the identified risks of opting out of care and the importance of shared responsibility as part of an effective collaborative treatment process, (2) an explanatory model that helps a patient understand their suicidality such that they can use tailored self-management skills that target the causes of suicide (rather than conceptualizing suicidality merely as a symptom of mental illness and/or psychiatric diagnosis), (3) a proactive approach to identifying and overcoming barriers to care helping facilitate overall treatment adherence, (4) development of a specific plan for successful management of future suicidal episodes, and (5) the importance of taking steps to safeguard lethal means, and in the United States specifically this means a particular emphasis

on the safe storage of firearms. All of these recommendations coalesce around a single, central theme that can best be described as the essential importance of recognizing and utilizing a suicide-focused treatment that directly addresses the problems and causes of suicide, routinely monitors patient progress toward these goals, and proactively integrates proven strategies to facilitate patient safety.

The development and application of a standard clinical management protocol has two important advantages for practicing clinicians struggling with how best to integrate scientific advances into day-to-day clinical care with high-risk suicidal individuals. First, and arguably most important, it allows for the integration of clinical strategies demonstrated to be safe and effective for suicidal individuals. Second, utilization of empirically supported strategies also helps build individual self-management skills, improve self-efficacy, facilitate hope, reduce related symptoms, and fuel a wish to live. Arguably, each of the five domains summarized actively engage the patient in clinical activity that facilitates overall self-awareness, self-management, and emotion regulation.

This article is not intended to be a comprehensive review of what is a broad, deep, and rapidly expanding literature base in clinical suicidology. Rather, it is a distillation of critical areas of convergence in the RCT literature that have practical and important relevance for day-to-day clinical care of suicidal individuals across identified domains, with specific recommendations on what and how to implement effective clinical strategies. Although the precise mechanisms of action underlying effective interventions and treatments remain unclear, converging data suggests the simple strategies summarized inspire hope and help develop individual self-management skill that serve a positive and potentially life-saving purpose. In recognition of the converging nature of RCT findings to date and the identified commonalities of treatments that work despite differences in terminology and related jargon, the clinical recommendations offered below are generic in nature and not specific to a given treatment approach or trademarked intervention.

Naturally, the recommendations offered are not static in nature. Rather, they need to continue to grow and evolve as RCT outcome data becomes available. Accordingly, the recommendations will undoubtedly need to be revisited, revised and likely expanded in the coming years. Regardless, they provide a starting point for how to integrate available scientific findings into day to day clinical practice with suicidal individuals.

INFORMED CONSENT AND THE INITIAL DIALOGUE WITH INDIVIDUALS WHO ARE SUICIDAL ADDRESSING RISKS, PERSONAL RESPONSIBILITY, COLLABORATIVE CARE, AND TREATMENT HESITANCY

Informed consent is a universal expectation the cuts across all mental health disciplines and is not unique to care to with individuals who are suicidal. Informed consent expectations are articulated in ethics guidelines and licensing boards rules of practice shaping the delivery of clinical care regardless of the severity of suicide risk (9). The full range of issues relevant to risks specific to the treatment of those presenting with suicidality (i.e., risk for suicide, suicide attempts, and suicidal thinking) have been raised and discussed in detail elsewhere and will not be repeated here [e.g., (10)]. Ethics guidelines and licensing boards rules of practice are clear in identifying a professional obligation to share risk information with those considering or engaging in clinical care, including the risks of various treatment alternatives, along with the nature of risk when a decision is made to opt out of care.

A unique commonality from RCT's targeting suicidality and from the perspective of a standard protocol is that effective treatments not only identify suicide-specific risks, but also include a clear statement about the importance of personal responsibility as part of a collaborative process in treatment, along with the specific expectations of the suicidal individual during care, including the possible integration of family and loved ones into the process from the outset. All those involved in the clinical care process should recognize and accurately understand suicide-specific risks from the start. As noted previously, this is an actual clinical intervention not just a guiding principle, it is an active discussion with the patient, not simply inclusion of text in an informed consent document. Effective RCT's actively engaged patients in discussions targeting not just suicide-specific risks, but also the importance of personal responsibility and how that translates to specific tasks and skills in clinical care.

From the outset, treatments that work emphasize that the process is collaborative by nature, the importance of personal responsibility, and that embracing both help facilitate treatment adherence essential to effective care and successful outcomes. As noted in a separate recommendation below, this is coupled with a commitment to be proactive in identifying and overcoming barriers to care, rather than simply waiting for problems to emerge that ultimately increase the probability of withdrawal from treatment. There are a range of therapeutic approaches and perspectives in the treatment literature on how best to accomplish informed consent and organize this initial dialogue and intervention, among the most frequently cited are dialectical behavior therapy (DBT) (11), cognitive therapy for suicide prevention (CT-SP) (12), brief cognitive behavioral therapy for suicide prevention (BCBT-SP) (13, 14), attempted suicide short intervention program (ASSIP) (15), and the collaborative assessment and management of suicidality (CAMS) (16).

Despite differences in theoretical approaches and perspective, one of the identified commonalities of effective treatments is that they address the issue of individual responsibility in collaborative care as part of the broader informed consent process, doing so at the very beginning of care, and ultimately laying an important foundation for several other critical elements discussed below regarding planning for successful management of future episodes of suicidality and taking steps to reduce access to lethal means and improve safe storage. Additionally, they recognize that addressing the importance of a collaborative process and defining what that means in terms of patient behavior from the outset creates a unique opportunity to simultaneously target treatment

hesitancy should it emerge (17). The most frequently used strategy to address treatment hesitancy among those that no-show for their first appointment is a brief phone call, allowing exploration and discussion of a range of issues, including (a) myths about treatment, (b) stigma and shame, (c) barriers to care, (d) that treatment is a time-limited process, and (e) a lack of hope regarding treatment effectiveness. It is important to note that any discussion targeting treatment hesitancy also creates an opportunity for development of a brief crisis management plan, including means safety steps, even if a decision is made to opt out of care. Specifically, discussion of the limited duration of treatment can be highly motivating [e.g., (4, 9–14) sessions of suicide-focused care] (16).

Recommendation 1*: Clinicians engage the suicidal individual (and potentially key supporters) in discussion of anticipated risks of both pursuing clinical care and opting out of care, emphasizing that active clinical care has been demonstrated to reduce future risks and improve self-management skills.*

Recommendation 2*: Clinicians clearly and specifically state that treatment is a collaborative endeavor, there is individual responsibility for active engagement in care, and that it helps to be proactive in identifying barriers to treatment adherence. As part of this discussion, clinicians specifically identify and discuss individual expectations for care such as: keeping scheduled appointments (or notifying when unable to attend), completing treatment exercises, developing a plan for management of future suicidal episodes, experimenting with new behaviors, sharing feelings (negative and positive), taking medications as prescribed, and limiting access to lethal means.*

Recommendation 3: *When patients no show for their initial appointment, clinicians proactively address treatment hesitancy, with a brief phone call being the most widely used strategy to target myths about treatment and barriers to care. If the suicidal individual opts out of care, the clinician attempts to implement a plan to manage future suicidal crises and carefully documents this information.*

USE OF EXPLANATORY MODEL THAT TARGETS INDIVIDUAL SELF-MANAGEMENT SKILLS AND REDUCES SHAME

One of the commonalties of treatments that work identified by Rudd and Munoz-Perez (4) emphasized the importance of an explanatory model targeting suicidal ideation and behaviors as transdiagnostic in nature and focused on the importance of self-awareness and emotional management skills, problem-solving, and active coping rather than describing suicidal ideation and behaviors as the direct result of core psychopathology, clinical diagnosis, and/or mental illness [e.g., (17)]. Again, reviewing and agreeing with the patient on an explanatory model to guide treatment is a clinical intervention, one that includes the elements summarized below as a framework for clinical content, and one that is frequently revisited and updated throughout care. Why use of such a model is effective is unclear at this point, but one possibility is that disconnecting suicidal ideation and behaviors from mental illness and psychiatric diagnosis may reduce stigma and shame common among those struggling with thoughts of killing themselves (18). Another possibility is that the core mechanisms underlying suicidal ideation and behaviors are transdiagnostic and therefore orthogonal to mental illness (19).

Although the majority of RCT's that have been effective in reducing suicidal thinking and/or suicide attempts employ models often described or labeled as cognitive-behavioral in orientation, the underlying principles and clinical strategies used in these treatments are not unique to this single theoretical perspective. As noted above, examples of frequently cited treatment approaches utilized in RCT's are Linehan's (11) dialectical behavior therapy, Jobes' CAMS (16, 20), CBT-SP (12), brief cognitive behavioral therapy (13, 14, 21), and Attempted Suicide Short Intervention Program (ASSIP) (15). Most (arguably all) of these treatment approaches employ interventions and strategies that target self-regulatory processes, especially strategies designed to improve the patient's ability to recognize and change aversive and dysregulated emotional states. Relaxation skills training, for example, is frequently used to reduce episodes of acute autonomic arousal, which increases vulnerability to suicidal behavior. Cognitive reappraisal skills training is another commonly used clinical strategy. Critically, the cognitive reappraisal skills training used in these treatments focus on thoughts and beliefs that contribute directly to acute suicidal episodes (e.g., hopelessness, perceived burdensomeness, and entrapment) rather than thoughts and beliefs that are associated with depression, anxiety, and other psychiatric conditions in general.

Translating suicidality as a function of limited individual self and emotional managements skills, problem-solving, or ineffective coping has a number of advantages, including: (a) it can be shared with a suicidal individual in a manner that fits with each unique individual history allowing someone to understand how developmental experiences (e.g., including previous trauma, family history, and genetic predisposition) create individual vulnerability and limit the opportunity to develop and refine much needed self and emotional management skills, (b) the model is easy to understand, remember, and apply to daily life experiences, (c) it creates an opportunity to address apprehension about treatment as being a function of limited self and emotional management skills, (d) it has been demonstrated to fuel hope and wish to live (22), (e) it emphasizes the importance of individual responsibility in self-management, (f) recognizes the importance of and explains the destructive role of shame and guilt (23), and (g) translates to simple, skill-based interventions that can be practiced in session and utilized in the plan for management of future suicidal episodes. In short, effective interventions help patients develop a working model of their own suicidality and the nature of their own upset, so that targeted interventions be used to more effectively self-manage suicidal impulses.

It is, arguably, easiest to employ a multi-stage model when delivering care and reviewing the patient's most recent suicidal

episode. Common across the previously identified treatment approaches is clinical content including a recognition of multiple elements that provide the suicidal individual with an explanatory model, including individual history that creates potential vulnerabilities; environmental and contextual factors that activate and/or sustain suicidal episodes; interactions among suicide-related cognitions, beliefs, and reasons for dying; individual emotional and physiological response; and associated coping behaviors that have proven ineffective to date. Consistent across these treatments is an emphasis on the importance of creating meaning and purpose in life, ultimately enhancing the value of living.

Recommendation 4*: Clinicians use an explanatory model that targets the development of self and emotional management skills as essential to resolving suicidal thoughts and behaviors. Ideally, the model will proactively reduce shame and identify the role of developmental history and related experiences (e.g., trauma) in understanding why skill development opportunities were limited earlier in life, and identify new ways for strengthening the subjective value of living relative to dying.*

PROACTIVELY IDENTIFYING BARRIERS TO CARE AND PROBLEM SOLVING TO IMPROVE TREATMENT ADHERENCE

Using defined clinical strategies that proactively intervene and engage the suicidal individual about treatment adherence and a focus on overcoming barriers to care is one of the common elements of treatments that work for suicidality. For the majority of treatments or interventions demonstrated to be effective, addressing the issue of treatment adherence is essential to the theoretical orientation and woven into the fabric of the conceptual model driving clinical care (24). Anticipating, identifying and effectively responding to treatment adherence problems recognizes that there are many reasons why someone might not be able to fully engage in treatment. Among strategies demonstrated effective are: (a) active discussion about barriers to care starting in the initial session, (b) a perspective that barriers to care are to be expected and understandable given the patient's often limited resources, life context and limited self and emotional management skills, (c) recognition that poor treatment adherence is often not a conscious individual choice but the function of a convergence of multiple, difficult circumstances driving suicidality, (d) identification and discussion of the role of stigma, and (e) proactive assessment of the individual's subjective belief they can complete the assigned task(s) (25). Within CAMS, for example, identifying potential barriers to treatment is a key element at the end of the CAMS Stabilization Plan—an essential tool used across the course of care (16). In BCBT, by comparison, the Commitment to Treatment Statement can be used to identify and problem solve a patient's barriers to treatment (14, 26).

Recommendation 5: *Clinicians anticipate, intervene, and proactively target treatment adherence difficulty as an expected and understandable challenge with suicidal individuals.*

A SPECIFIC PLAN FOR MANAGEMENT OF FUTURE SUICIDAL EPISODES

One of the strongest points of convergence across RCTs is data regarding the effectiveness of safety planning, crisis response planning, and stabilization planning as clinical strategies that anticipate the emergence and importance of individual management of future suicidal episodes. Stanley et al. and Ferguson et al. (27, 28) have reported on the effectiveness of the safety planning intervention (SPI) for reducing suicidal behaviors, Tyndal et al. (29) have reported on the effectiveness of the CAMS stabilization plan for reducing suicidal ideation, and Bryan et al. (22) have reported on the effectiveness of the crisis response plan for reducing both suicidal behaviors and suicidal ideation. Despite differences in terminology and format (e.g., use of form templates vs. index cards or digital applications), the clinical strategies referenced above all target the development and implementation of a proactive and specific plan for individual management of future suicidal episodes. The specific steps used in each also vary somewhat but overlap substantially with respect to their mutual emphasis on (a) recognizing the onset of acute crises and/or having clearly articulated thresholds for use, often referred to as "warning signs"; (b) self-management activities (i.e., including a range of emotional regulation, self-soothing strategies, and distraction techniques; (c) thoughtful and careful use of social support; (d) steps for contacting crisis services and/or other sources of professional intervention (e.g., mental health professional's phone number; National Suicide Prevention Lifeline for those in the U.S. or other crisis hotlines specific to the country); and (e) specific steps to follow to activate emergency service in the event self-management and other strategies prove ineffective.

Recommendation 6: *Clinicians develop and implement a specific plan for the management of future acute suicidal episodes. The plan should include, at a minimum, the following identifiable steps: a) statement of threshold for use (i.e., when to use the plan), b) steps for individual self-management prior to any external intervention, c) use of external crisis phone intervention prior to having the suicidal individual go to the emergency room (e.g., National Suicide Prevention Lifeline, National Crisis Textline, national crisis line specific to the country, crisis lines for local service provider), d) a recommendation to go to a specific emergency room (provide address) if suicidality and motivation to die persists despite implementation of the previous steps.*

A SPECIFIC PLAN FOR SAFE STORAGE AND LIMITING ACCESS TO LETHAL MEANS

In light of a growing body of evidence demonstrating that availability of lethal means is strongly associated with suicide attempt lethality (7, 30, 31), that a large percentage of suicidal individuals experience significant and regular fluctuations in suicidal thinking and motivation to die (32), and that the decision to make a suicide attempt often occurs with very limited planning

and within minutes to an hour of onset (33, 34), taking steps to limit access to lethal means is an important part of the broader clinical management strategy for suicidal individuals. Where a suicide attempt method is sufficiently common and sufficiently lethal, restricting or limiting access to the method significantly reduces suicide mortality (35).

Although mental health professionals often are not able to directly limit or restrict their patients' access to potentially lethal methods for suicide, they can encourage and support means restriction via lethal means counseling. Across multiple RCTs, lethal means counseling has been shown to result in sustained improvement in environmental safety when delivered to the at-risk individual or the parents of at-risk youths (36). In the United States, owing to the extremely high case fatality rate of firearms when used as a suicide attempt method, clinicians are encouraged to ask about firearm access specifically, even with patients whose suicidal ideation and plans involve non-firearm methods. Anestis et al. (36) convincingly demonstrated that lethal means counseling and distribution of cable locks significantly increased the use of secure storage practices (e.g., storing ammunition separate from firearms, use of locking devices).

A key component of lethal means counseling is the development of a concrete plan to limit or reduce access to a given method. A common approach for developing these means safety plans is to include them as a component of the crisis management plans described in the previous section. The SPI and CAMS stabilization plan, for example, include a section focused on environmental safety. Alternatively, lethal means counseling can be conducted as a standalone intervention. A means safety plan, for example, can be developed in conjunction with crisis response planning. In BCBT, patients are invited to include family members and/or other trusted members of a patient's social support network to assist with developing and implementing means safety plans and, often times, complete a "means safety receipt" (14, 37). Lethal means counseling could also be integrated into the informed consent process, potentially during discussions about treatment risks and benefits (4). Regardless of the specific approach employed to encourage or promote reduced access to potentially lethal suicide attempt methods, accumulating data support the effectiveness of lethal means counseling as a critical element of clinical care for suicidal individuals.

Consistent with injury prevention models, means safety plans that include procedures and steps for completely removing a potentially lethal method is probably most effective. However, complete removal of a given method is frequently not possible, whether due to practical limitations (e.g., removing all ligatures and sharp objects from a home) or patient preference (e.g., discomfort with surrendering one's firearms, common among veterans). Under these circumstances, means safety plans can instead focus on placing barriers between patients and potentially lethal methods for suicide, thereby reducing or delaying immediate access to the method during an acute suicidal episode. Emerging evidence suggests that such barriers may serve to reduce the frequency and/or intensity of suicidal ideation (22, 38, 39), perhaps because these barriers serve as both physical psychological deterrents.

Recommendation 7: *Regardless of methods identified by the suicidal individual, clinicians always inquire about access to and/or possession of a firearm or other potentially lethal means.*

Recommendation 8: *Clinicians develop a specific plan to limit access to lethal means, including safe storage of firearms when present.*

INFORMING THE PUBLIC HEALTH NARRATIVE FOR SUICIDE PREVENTION

The distillation of available findings from RCTs targeting suicidality offer some simple but important recommendations for utilization of a collection of clinical strategies as part of a standard protocol for the delivery of care with suicidal individuals. Similarly, available data have important implications for the clinical suicide prevention narrative for suicide prevention. These data can be translated into several simple recommendations. First, suicide prevention campaigns should help reduce shame and stigma, move away from mental illness as a central explanatory variable, and emphasize that learning effective self and emotional management skills is essential to navigating life challenges and stressors, coupled with recognition that in many cases early trauma and adverse childhood experiences (ACEs) inhibit opportunities for much needed skill development. Mental illness is not the causal problem, rather, it is the individual's ability to effectively manage the illness, coupled with access to resources that facilitate more effective self-management. Second, clinical suicide prevention narratives need to address the issue of barriers to effective care, acknowledging that these barriers are often part of the very stressors involved in elevating suicide risk, and actively work to remove these barriers and expand access. At the institutional or system level, this translates to recognition and acknowledgement of policies and practices that may well undercut access to effective care options. Third, clinical suicide prevention narratives can help undercut myths about clinical care and treatment that fuel treatment hesitancy, helping make it clear that life problems are solvable and emotional pain manageable. Fourth, the clinical suicide prevention narrative can share widely the importance of plans to manage future suicidal episodes, much like is the case with heart attack and stroke, offering specific recommendations for suicidal individuals to follow. Those plans need to include more than just the National Suicide Prevention Lifeline, Textline, or other country-specific crisis lines, expanding in thoughtful ways to local resources. And finally, the clinical suicide prevention narrative needs to embrace and expand the importance of safe storage of firearms and other lethal means as central to success in reducing the number of deaths by suicide.

RCT's represent a unique resource for the delivery of clinical care to those struggling with suicidality. The current recommendations are a starting point for day-to-day clinical practice, recommendations that will need to be periodically revisited, revised, and updated as the scientific literature continues to grow. Additionally, incremental progress in the scientific foundation for clinical suicidology is essential to broader efforts in clinical suicide prevention. The identification of a common clinical strategies helps move this process forward

with a small, but important step. One of the most significant advantages of a standard protocol is narrowing the broad variations in care, offering an empirically supported and clearly identifiable foundation for clinical care, one that reaches across the full range of clinical contexts. Ultimately, this may well help improve the targeted allocation of limited resources, with a net positive impact on the overall quality of care delivered.

A much needed and natural extension of these recommendations is identification and testing of criteria to assess adherence and fidelity of clinical delivery for the clinical strategies summarized. Subsequent work will offer a clinical toolkit for clinicians, coupled with applicable fidelity checklists for clinical delivery of care.

AUTHOR CONTRIBUTIONS

MD, CB, DJ, SF, and DC were involved in the conceptualization, development, and writing of the current manuscript. All authors contributed to the article and approved the submitted version.

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The remaining author declares 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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Music-based casual video game training alleviates symptoms of subthreshold depression

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Objectives: In this preregistered study, we investigated the beneficial effects of music-based casual video game training on the depression, anxiety and stress symptoms in a cohort of young individuals with subthreshold depression and the underlying mechanisms.

Methods: The study included 56 young individuals (18–26 years of age) with subthreshold or mild depression based on the Beck Depression Inventory-II (BDI-II) scores between 14 and 19. They were randomly assigned into the experimental group ($n = 28$) or the control group ($n = 28$). The experimental group underwent music-based casual video game training for 4 weeks. During the same time, the control group participants conducted daily life activities without any intervention. The study participants in the two groups were analyzed using the Depression Anxiety and Stress Scale (DASS-21) during the baseline before the intervention, as well as DASS-21, Positive and negative Affect Scale (PANAS), General Self-efficacy Scale (GSES), and the Emotional Regulation Questionnaire (ERQ) twice a week during the 4 weeks of intervention.

Results: The depression, anxiety, and stress symptoms were significantly reduced in the experimental group participants after 4 weeks of music-based video game training compared with the control group. The DAS scores in the experimental group were alleviated in the third and fourth weeks of training compared with the control group. Moreover, analysis using the general linear model demonstrated that the number of training weeks and self-efficacy were associated with significant reduction in depression, anxiety and stress. Furthermore, our results demonstrated that self-efficacy was correlated with positive emotion and emotional regulation.

Conclusion: Our study showed that music-based casual video game training significantly decreased depression, anxiety, and stress in the young individuals with subthreshold depression by enhancing self-efficacy.

KEYWORDS

music-based video game, subthreshold depression, intervention, anxiety, stress, self-efficacy

Introduction

Depression is a mood disorder characterized by persistent feeling of sadness, loss of interest in the daily activities, poor emotional regulation, and suicidal tendencies. Depression includes many different states that range from absence of any depression to very severe depression (1, 2). Patients with subthreshold depression show clinically significant symptoms of depression but do not meet the criteria for positive diagnosis of a major depressive disorder. However, subthreshold or mild depression is a risk factor for major depression (3). Furthermore, subthreshold or mild depression is highly prevalent (4) and is associated with significant economic burden, functional impairment, and suicide risk (5). Therefore, identification and intervention of subthreshold or mild depression is essential for preventing the onset of major depression and other adverse outcomes.

Traditional treatments for depression such as cognitive behavioral therapy (CBT), interpersonal psychotherapy (IPT), and supportive therapy are also commonly used to treat subthreshold or mild depression symptoms. These interventions demonstrate low to moderate effects in the youth (2). In recent years, several digital interventions including video game training have emerged for treating depression especially in the youth (6). Video game interventions have several advantages over traditional treatments for depression. Firstly, therapy with video games can be engaging and acceptable to individuals who find CBT to be boring and do not recognize or accept their mental health problem (7). Secondly, face-to-face CBT is conducted with a therapist on a one-to-one basis or in groups with other individuals needing similar help. However, video game training can be personalized to the needs of every patient at a lower cost (8). A recent systematic review demonstrated that the video game-based interventions such as serious games (9), commercial video games (10), and casual video games (11) significantly reduced the symptoms of depression (9). Moreover, casual video games are easy, interesting, brief and convenient, and do not require additional knowledge or skills of operation (11). A systematic review demonstrated that casual video games significantly reduced the symptoms of anxiety and depression, and improved the mood (11).

The video game-based interventions reduce the symptoms of anxiety and depression by modulating emotion and cognition. The Casual Video Games were defined as fun, fast to access, and simple to learn and requiring no previous video game skills or time commitment to play [Casual Games (12)]. Casual video games decrease the mental distress by providing participants with a relaxing and entertaining experience (13). Video game interventions also modulate emotions *via* the cognition pathway. A meta-analysis of several studies showed that frequent playing of video games moderately enhanced the executive functions (14). Another study demonstrated that action video game training improved the executive functions (15). Furthermore, executive functions positively regulated emotions, enhanced performance, and positive affect (16). A meta-analysis of several studies demonstrated that working memory training in executive functions enhanced emotional regulation *via* changes in the electrical and physiological activities of the brain (17). Effective regulation of emotions is essential for maintaining normal social functions as well as the physical and mental health of an individual. On the contrary, excessive emotional responses, individual differences in executive function, and abnormal regulation of the brain emotion networks are associated with abnormal social behaviors including anxiety disorders and depression (18). These data suggested that training of executive functions may alleviate emotional problems. A previous report demonstrated that improvements in cognitive control and executive functions by training significantly reduced the depressive symptoms characterized by intrusive thinking (19).

Video game interventions may also influence the mood by increasing self-efficacy, which refers to the belief that a person is capable of coping with stressful events or challenges (20). High self-efficacy is associated with lower levels of negative emotions and higher levels of positive emotions and achievements (21). Individuals with higher self-efficacy show a sense of control in difficult situations and believe that they can find a solution to their problems (22). The video game settings provide intermittent reinforcement and optimism for the players in a school or a working environment (7). Individuals with higher self-efficacy show a higher rate of behavioral initiative, persistence, and positive emotions because of their belief that good outcomes can be achieved through positive behaviors (23, 24). Therefore, video games may strengthen the perception of self-efficacy among the players and enable them to solve problems in their daily life by increasing positive emotions.

Several studies have shown that music therapy and other music-based interventions reduce the depressive symptoms in the adults (25–27). Furthermore, music therapy and other music-based interventions decrease depression in adolescents and elderly patients by reducing internalization problem, anxiety and depression, and facilitating their psychological needs (28–30). Specifically, music-based interventions effectively reduce internalization problems in children and adolescents (28). They also effectively reduce anxiety and depression levels in the adolescents (29) and contribute to the psychological needs of the elderly (30). Music therapy directly affects the emotional response and improves the ability of the patients to regulate emotions. Music activates the brain regions associated with reward and cognitive control, including the anterior cingulate cortex (ACC), orbitofrontal cortex (OFC) and lateral prefrontal cortex (PFC), and suppresses activity in the amygdala (31–34). These results are consistent with the activation patterns of the emotional regulation

process. A recent study of adolescents with depression showed significant reduction in the depressive symptoms and significant improvement in mood regulation after 12 sessions of music therapy (35).

In the present study, we investigated the potentially beneficial effects of music-based casual video game training for 4 weeks in young individuals with subthreshold or mild depression and the underlying mechanisms. The study protocols and predictions were pre-registered on AsPredicted.org (#80788).

Materials and methods

Participants

Participants were recruited by distributing flyers, posters, and advertisements on social media and other online platforms. The interested participants were screened by research assistants based on the inclusion and exclusion criteria: we excluded participants that played music games for more than 5 h in the last 2 weeks to prevent the case of behavioral addiction and those diagnosed with psychotic disorders, major depression, or bipolar disorder. Participants with a score between 14 and 19 on the Beck Depression Inventory-II (BDI-II) scale were considered as subthreshold or mild depression (36, 37). Fifty-six participants who meet the criteria were included in the study. These participants received detailed information of the study and signed online informed consent. After recruitment, the participants were randomly assigned into the intervention group (28 participants, 18 females, age mean ± SD: 20.82 ± 2.31 years) or the control group (28 participants, 22 females, age mean ± SD: 20.67 ± 2.11 years). Baseline assessment of Depression Anxiety and Stress Scale (DASS-21) was then performed on all the participants. Afterwards, the experimental group underwent music-based casual video game training for 4 weeks. During the same time, the control group participants conducted daily life activities without any intervention. Few participants were unable to persevere and dropped out of the study during the 4 weeks of video game training or continued assessment. Finally, the experimental group left with 15 participants (12 females, age mean ± SD: 21.08 ± 2.40 years) and the control group left with 18 participants (14 females, age mean ± SD: 21.33 ± 3.18 years). The recruitment protocol is shown in Figure 1. All experimental protocols were approved by the institutional review board at the Sun Yat-sen University (2020-0515-0140).

Music-based video game

The music-based video game used in this study was custom developed by Tencent (Shenzen, China) based on the requirement of this study and was implemented in the Roblox Platform. This game was easy-to-operate and could be adapted with different degrees of difficulty. The music for the present game is selected from previous intervention studies on affective disorders, e.g., depression (38) and anxiety (39). The interface of the game is shown in Figure 2. The study participants received a score based on their performance in operating the game at the right time according to the instructions appearing on the screen based on the rhythms of the background music. The scoring criteria of every press is listed in Table 1. Total score = [(perfect × 1) + (nice × 0.75) + (good × 0.6)] ÷ (perfect + nice + good + miss) × 100. Every participant was rated according to the total score that showed in Table 2.

Beck depression inventory-II scoring system

The revised Chinese version of the Beck Depression Inventory-II (BDI-II) scale (36, 40) was used to assess the severity of depression. This measure is a reliable and valid measure of the depressive symptoms in both clinical and non-clinical populations (36). The BDI-II scale is comprised of 21 symptoms and features of depression, which are scored on a 4-point scale ranging from 0 to 3. The total score was calculated from the sum of scores for each of the 21 items. The standard cut-offs were as follows: 0–13, no depression; 14–19, mild depression; 20–28, moderate depression; and 29–63, severe depression. BDI (II) test showed high test-retest reliability ($r = 0.55$; $p < 0.05$) with a Cronbach's alpha value of 0.94 (40).

Depression anxiety and stress scale (DASS-21)

The revised Chinese version of the Depression Anxiety and Stress Scale (DASS-21) (41, 42) was used in this study. This scale included 21 items with 7 items each for depression, anxiety, and stress. The cut-off values for depression were as follows: below 10, mild depression; 11–14, moderate depression, and 15–21, severe depression. The cut-off values for anxiety were as follows: 0–8, mild anxiety; 9–10, moderate anxiety; and 11–15, severe anxiety. The cut-off values for stress were as follows: 0–15, mild pressure; 16–19, moderate; and 20–26, severe pressure. The revised DASS-21test showed high test-retest reliability ($r = 0.912$) with a Cronbach's alpha value of 0.89 (41).

Positive and negative affect scale

The revised Chinese version of PANAS (43) was used to assess the positive and negative emotions of the study participants. Both sections included 10 questions each. In this study, only the positive emotion scale was used to evaluate the

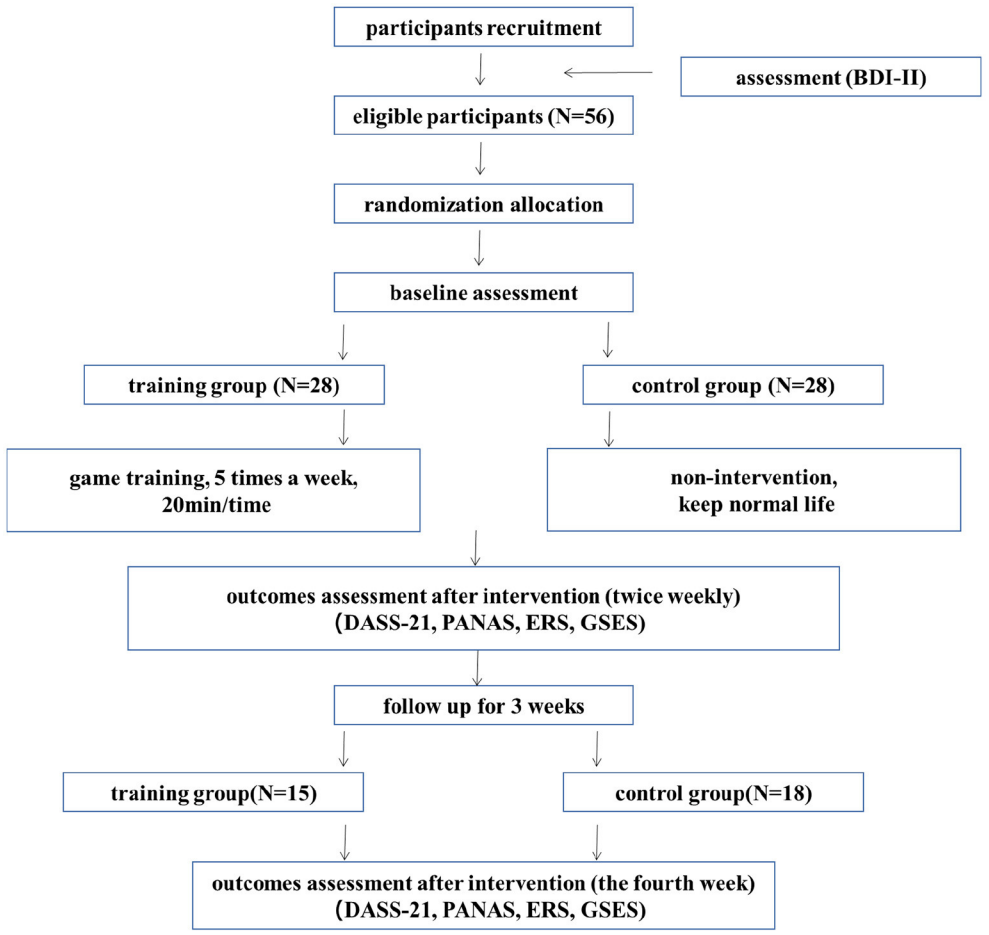

FIGURE 1
The study protocol.

participants. The progression of scores indicated the levels of negative or positive emotions. A score between 1 and 5 was awarded for each answer. The higher score indicated higher level of positive emotions. The PANAS test showed high test-retest reliability (r = 0.47) with a Cronbach's alpha value of 0.82 for the positive emotion (43).

General self-efficacy scale

The revised Chinese version of the General Self-efficacy Scale (GSES) was used in this study (44, 45). This scale included 10 questions with the following four options: "completely incorrect," "somewhat correct," "mostly correct," and "completely correct." A score between 1 and 4 was awarded for each answer. The higher score indicated higher level of self-efficacy. The GSES test showed high test-retest reliability (r = 0.83) with a Cronbach's alpha value of 0.87.

Emotion regulation questionnaire

The Chinese version of ERQ (46) consists of ten items, which are divided into two dimensions: cognitive reappraisal and expression inhibition. The measurement of cognitive reappraisal is composed of six items, and the measurement of expression inhibition is composed of four items. The emotional regulation scale is a seven-point scale, and the higher the score, the higher the frequency of using emotional regulation strategies. The retest reliability and Cronbach's alpha value of the emotion regulation questionnaire were 0.82 and 0.85, respectively. The retest reliability and Cronbach's alpha value of the expression inhibition dimension were 0.79 and 0.77, respectively.

Study protocol

The study protocol is shown in Figure 1. The experimental group participants received 4 weeks of training for a minimum

of 20 min per session, 5 sessions a week. The control group participants maintained their daily lifestyle. The DASS-21 were measured at baseline before the intervention. The DASS-21, PANAS, GESE, and ERQ were then measured twice weekly during the intervention.

Statistical analysis

The statistical analysis was performed with the JASP software version 0.16.1.0 (JASP Team, 2022), which offers standard Bayesian statistical operations. Firstly, we performed two-sample *t*-test for the DAS total scores and D/A/S sub-dimension scores between the experimental and control groups during baseline before the intervention. Secondly, we performed two-way repeated-measures repeated measures analysis of variance (ANOVAs) with the group as the between-subject factor and the week as a dependent measure. Two-way repeated measures ANOVA was performed to test the differences between the groups and the weeks of intervention for the DAS scores, D/A/S aspects of the DAS scale and PA/ER/GSE scores. Thirdly, independent-sample *t*-tests were then performed to test differences between the experimental and control groups for each week. Lastly, to examine the correlation between DAS, PA, ER and GSE, we performed the Pearson correlation test between the DAS, PA, ER, and GSE scores measured over 4 weeks in the experimental group. We also report Bayesian Factor (BF) values for these analysis. Firstly, we analyzed the Bayesian two-sample *t*-test for the DAS total scores and D/A/S sub-dimension scores between the experimental and control groups during baseline before the intervention. Secondly, we analyzed the Bayesian ANOVA for these scores between the experimental and control groups during the 4 weeks, with the group as the between-subject factor and the week as a dependent measure. Bayesian repeated measures ANOVA was further performed to test the differences between the groups and the weeks of intervention for the depression, anxiety, and stress aspects of the DAS scale, respectively. Thirdly, we performed the Bayesian Pearson correlation test between the DAS, PA, ER, and GSE scores that were assessed during the 4 weeks in the experimental group. Fourthly, Bayesian analysis of covariance (ANCOVA) test was performed to further determine the relationship between the DAS, PA, ER, and GSE scores, with the subject as a random effect and the week as a fixed effect. When performing the Bayesian ANCOVA, we examined the best model among the various models by comparing the BFs. We used the default values for priors and other parameters in JASP. The evidence was evaluated to determine how the data fitted into the alternative model compared with the null model. The Bayes factor (BF) cutoffs were as follows: <3, anecdotal; 3–10, substantial; 10–30, strong; 30–100, very strong; and >100, extreme evidence (47).

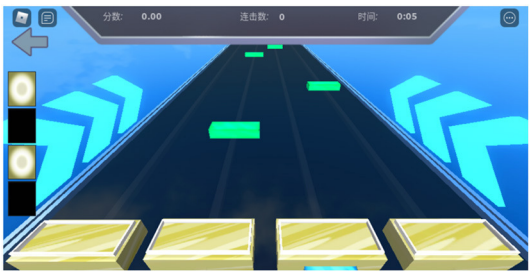

FIGURE 2
Representative interface of the musical video game.

TABLE 1 The scoring criteria of every press in the video game.

Rating (key)	Reaction time
PERFECT	−40 ~ 20 ms
NICE	20 ~ 50 ms
GOOD	50 ~150 ms
MISS	>150 ms

TABLE 2 Game rating corresponding to different total scores.

Rating (association)	Total score
SS	100–95
S	95–90
A	90–75
B	75–60
C	60–50
D	<50

Results

Music-based video game training for 4 weeks reduces dASS-21 scores in participants with subthreshold or mild depression

The study participants in the experimental and the control groups were matched in DASS-21 scores (mean ± SD: Experimental group 45.846 ± 9.36; Control group 42.61 ± 9.34; $t_{(29)} = 0.95$, $p = 0.35$, Cohen's d = 0.35; $BF_{10} = 0.48$). The baseline sub-scores were calculated for Depression (mean ± SD: Experimental group 15.08 ± 4.73; Control group 13.06 ± 3.54), Anxiety (mean ± SD: Experimental group 14.85 ± 3.29; Control group 13.28 ± 3.03), and Stress (mean ± SD: Experimental group 15.93 ± 3.15; Control group 16.28 ± 3.50). There was no significant difference between the experimental group and the training group in all the three sub-dimensions. (D: $t_{(29)} = 1.36$,

$p = 0.18$, Cohen's d = 0.50, $BF_{10} = 0.69$; A: $t_{(29)} = 1.37$, $p = 0.18$, Cohen's d = 0.50, $BF_{10} = 0.70$; $t_{(29)} = -0.29$, $p = 0.77$, Cohen's d = −0.11, $BF_{10} = 0.36$). The baseline test indicated the participants were moderate in depression, severe in anxiety, mild to moderate in stress. The depression-anxiety-stress (DAS) scores of the experimental group gradually decreased during the 4 weeks of music-based video game training but the depression-anxiety-stress scores of the control group remained unchanged during the 4 weeks (see Table 3 and Figure 3).

We performed a 2(GROUP: experimental group vs. control group)× 4 (WEEK: week 1, 2, 3, 4) classical and Bayesian repeated measures ANOVA for all the assessment scales to test differences between the study groups, as well as changes across weeks of intervention. For depression-anxiety-stress scales, the main effect of WEEK showed extreme evidence for the alternate hypothesis over the null hypothesis [$F_{(3,93)} = 14.84$, $p < 0.01$, $\eta_p^2 = 0.33$; $BF_{10} = 1, 209.84$]. *Post-hoc* tests showed extreme evidence for the alternative hypothesis with significant differences between the first and the fourth weeks of treatment [$t_{(32)} = 6.16$, $p < 0.01$, Cohen's d = 0.50; $BF_{10} = 142.60$]. The main effect of GROUP showed little evidence for the alternate hypothesis [$F_{(1,31)} = 1.33$, $p = 0.26$, $\eta_p^2 = 0.04$; $BF_{10} = 0.73$]. However, extreme evidence was observed for the interaction GROUP×WEEK [$F_{(3,93)} = 12.39$, $p < 0.01$, $\eta_p^2 = 0.29$; $BF_{10} = 1.223e+7$]. Bayesian independent-sample *t*-tests for the alternative hypothesis (experimental group<control group) demonstrated that evidence that the experimental group alleviated symptoms more than the control group increased over time [week 1: $t_{(31)} = -0.11$, $p = 0.46$, Cohen's d = −0.04; $BF_{10} = 0.36$; week 2: $t_{(31)} = -0.14$, $p = 0.45$, Cohen's d = −0.05; BF_{10} =0.32; week 3: $t_{(31)} = -1.96$, $p = 0.03$, Cohen's d = −0.68; $BF_{10} = 2.64$; week 4: $t_{(31)} = -2.01$, $p = 0.03$, Cohen's d = −0.70; $BF_{10} = 2.88$]. Anecdotal evidence existed for the larger improvement in DAS symptoms for the experimental group in weeks 3 and 4.

The positive affect (PA, see Figure 4A) scores showed anecdotal evidence for the main effect of GROUP [$F_{(1,31)} = 3.75$, $p = 0.06$, $\eta_p^2 = 0.11$; $BF_{10} = 2.09$] and no evidence for the main effect of WEEK [$F_{(3,93)} = 0.37$, $p = 0.76$, $\eta_p^2 = 0.01$; $BF_{10} = 0.07$] nor the interaction GROUP×WEEK [$F_{(3,93)} = 1.36$, $p = 0.26$, $\eta_p^2 = 0.04$; $BF_{10} = 0.03$].

The emotional regulation (ER, see Figure 4B) scores showed very strong evidence for the main effect of GROUP [$F_{(1,31)} = 14.15$, $p < 0.01$, $\eta_p^2 = 0.31$; $BF_{10} = 39.97$] but no evidence for the main effect of WEEK [$F_{(3,93)} = 0.08$, $p = 0.97$, $\eta_p^2 = 0.01$; $BF_{10} = 0.05$] nor the interaction GROUP×WEEK [$F_{(3,93)} = 0.18$, $p = 0.91$, $\eta_p^2 = 0.01$; $BF_{10} = 0.17$]. The *post-hoc* tests showed extreme evidence for the alternative hypothesis of significant differences between the experimental and the control groups [$t_{(32} = 3.76$, $p < 0.01$, Cohen's d = 1.14; BF_{10} =1.398e+7], but the differences between the first and the fourth weeks were not significant [$t_{(32)} = 0.38$, $p = 1.00$, Cohen's d = 0.05; $BF_{10} = 0.20$].

The general self-efficacy (GSE, see Figure 4C) scores showed substantial evidence for the main effect of GROUP [$F_{(1,31)} = 8.75$, $p = 0.01$, $\eta_p^2 = 0.22$; $BF_{10} = 7.08$], but no evidence for the main effect of WEEK [$F_{(3,93)} = 0.30$, $p = 0.83$, $\eta_p^2 = 0.01$; $BF_{10} = 0.06$] nor the interaction GROUP×WEEK [$F_{(3,93)} = 0.23$, $p = 0.88$, $\eta_p^2 = 0.01$; $BF_{10} = 0.04$). *Post-hoc* tests showed extreme evidence for the alternative hypothesis of significant differences between the experimental and the control groups [$t_{(32)} = 2.96$, $p < 0.01$, Cohen's d = 0.92; $BF_{10} = 33,847.20$). However, the differences between the first and the fourth weeks showed little evidence to support the alternate hypothesis [$t_{(32)} = -0.50$, $p = 1.00$, Cohen's d = −0.07; $BF_{10} = 0.202$).

Music-based video games training decreases depression, anxiety, and stress scores as a function of the weeks of intervention

Furthermore, a 2(GROUP: experimental group vs. control group)× 4 (WEEK: week 1, 2, 3, 4) Bayesian repeated measures ANOVA was performed for the depression, anxiety, or stress aspects of the DAS scale respectively to test the differences between the groups, and changes across the weeks of intervention. The depression scores (D) showed strong evidence for the main effect of WEEK [$F_{(3,93)} = 9.28$, $p = <0.01$, $\eta_p^2 = 0.23$; $BF_{10} = 39.693$], but little evidence for the main effect of GROUP [$F_{(1,31)} = 0.28$, $p = 0.60$, $\eta_p^2 = 0.01$; $BF_{10} = 0.61$]. However, extreme evidence was observed for the interaction GROUP×WEEK [$F_{(3,93)} = 9.16$, $p = <0.01$, $\eta_p^2 = 0.23$; $BF_{10} = 18,159.24$]. *Post-hoc* tests showed strong evidence for the alternative hypothesis because of significant differences between the first and the fourth weeks [$t_{(32)} = 4.89$, $p < 0.01$, Cohen's d = 0.41; $BF_{10} = 10.06$], but there was little evidence to support the alternate hypothesis based on the differences between the experimental and the control groups [$t_{(32)} = -0.53$, $p = 0.60$, Cohen's d = −0.18; $BF_{10} = 0.30$]. Bayesian independent-sample *t*-tests for the alternative hypothesis (experimental group<control group) demonstrated that evidence that the experimental group alleviated depression symptoms more than the control group increased over time [week 1: $t_{(31)} = 0.46$, $p = 0.68$, Cohen's d = 0.17; $BF_{10} = 0.25$; week 2: $t_{(31)} = 0.24$, $p = 0.60$, Cohen's d = 0.09; $BF_{10} = 0.28$; week 3: $t_{(31)} = -1.07$, $p = 0.14$, Cohen's d = −0.37; $BF_{10} = 0.85$; week 4: $t_{(31)} = -1.63$, $p = 0.06$, Cohen's d = −0.57; $BF_{10} = 1.67$]. Anecdotal evidence existed for the larger improvement in depression symptoms for the experimental group in week 4.

The anxiety scores (A) showed extreme evidence for the main effect of WEEK [$F_{(3,93)} = 13.47$, $p = <0.01$, $\eta_p^2 = 0.31$; $BF_{10} = 1,532.08$], but little evidence for the main effect of GROUP [$F_{(1,31)} = 1.84$, $p = 0.19$, $\eta_p^2 = 0.06$; $BF_{10} = 0.84$]. However, the interaction between the group and the week

TABLE 3 Assessment scores of the participants in the experimental and control groups during the 4 weeks of musicbased video game intervention.

Assessment scales	Experimental group				Control group			
	1	2	3	4	1	2	3	4
DAS	41.46 ± 9.98	39.10 ± 9.64	33.63 ± 8.82	32.60 ± 9.06	42.22 ± 9.04	39.58 ± 10.35	41.19 ± 12.62	40.36 ± 12.43
PA	27.80 ± 7.92	28.16 ± 6.41	28.78 ± 5.80	28.53 ± 6.93	25.00 ± 4.67	25.53 ± 4.80	24.25 ± 5.25	23.75 ± 5.70
ER	50.33 ± 7.58	50.60 ± 6.52	50.53 ± 6.89	50.57 ± 6.36	44.11 ± 6.06	43.64 ± 4.65	43.22 ± 5.36	43.31 ± 6.48
GSES	26.40 ± 3.31	27.17 ± 4.09	27.20 ± 4.56	26.80 ± 4.65	23.31 ± 3.55	23.31 ± 3.55	23.08 ± 4.69	23.25 ± 4.27

DAS, Depression Anxiety and Stress Scale; PA, Positive Affect Scale; ER, Emotional Regulation Scale; GSES, General Self-Efficacy Scale; Weeks 1, 2, 3, and 4 are shown as 1, 2, 3, and 4, respectively.

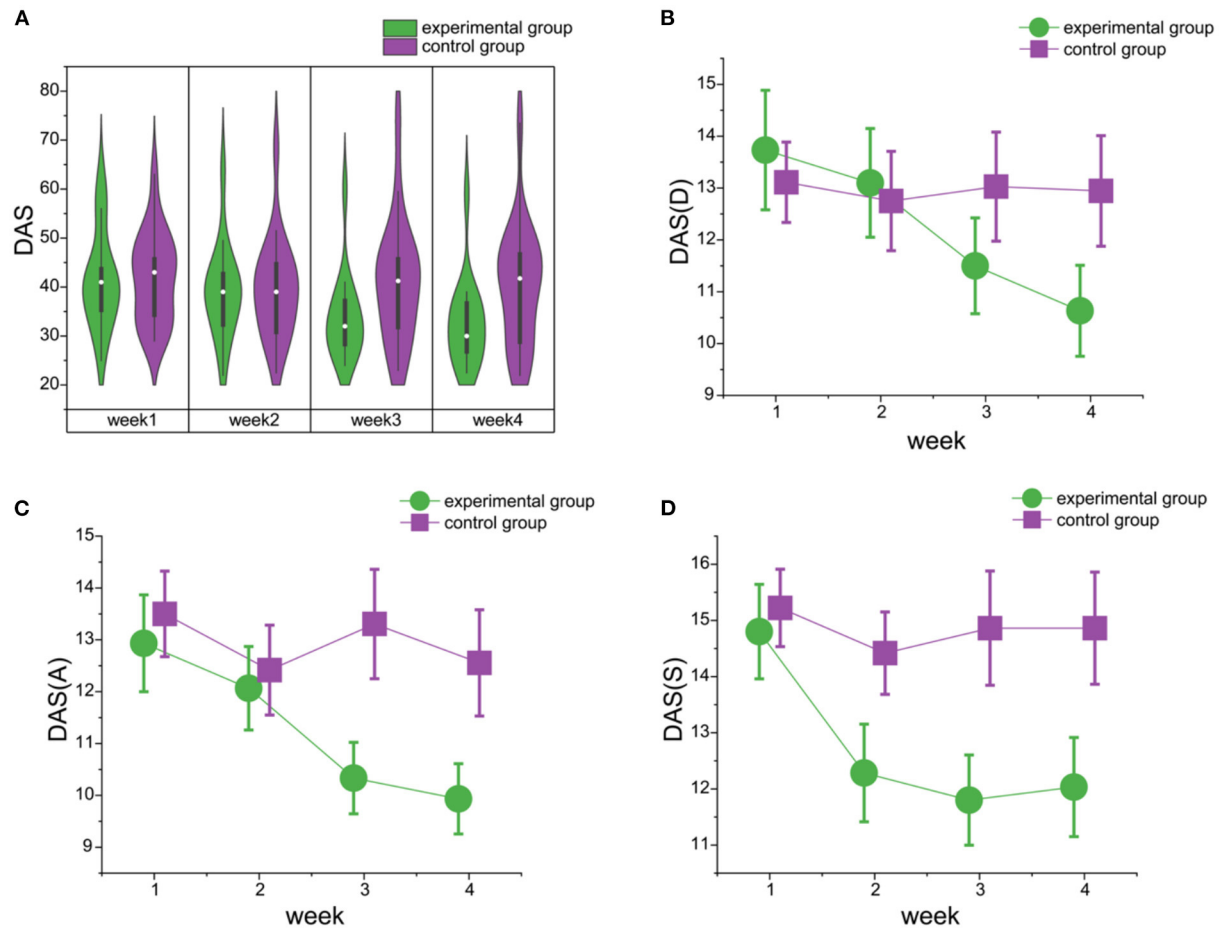

FIGURE 3
The changes in DAS scores during the four-week video game training in the experimental and control groups. **(A)** The violin plot shows the DAS scores for the study participants in the experimental (green) and the control (purple) groups during 4 weeks of video game training [experimental group: $F_{(3, 56)} = 3.10$, $p = 0.03$, $\eta_p^2 = 0.14$; $BF_{10} = 3.306e{+}5$; control group: $F_{(3, 68)} = 0.18$, $p = 0.91$, $\eta_p^2 = 0.01$; $BF_{10} = 0.78$). **(B)** The line chart shows the differences between the experimental and control groups on depression dimension scores. And the difference between the two groups for week 4 is supported by anecdotal evidence [week 4: $t_{(31)} = -1.63$, $p = 0.06$, Cohen's d = −0.57; $BF_{10} = 1.67$). **(C)** The line chart shows the differences between the experimental and control groups on anxiety dimension scores. And the difference between the two groups for weeks 3 and 4 is supported by substantial evidence [week 3: $t_{(31)} = -2.26$, $p = 0.02$, Cohen's d = −0.78; $BF_{10} = 4.24$; week 4: $t_{(31)} = -2.04$, $p = 0.03$, Cohen's d = −0.72; $BF_{10} = 3.03$]. **(D)** The line chart shows the differences between the experimental and control groups on stress dimension scores. And the difference between the two groups for weeks 3 and 4 is supported by substantial evidence [week 3: $t_{(31)} = -2.48$, $p = 0.01$, Cohen's d = −0.87; $BF_{10} = 6.24$; week 4: $t_{(31)} = -2.15$, $p = 0.02$, Cohen's d = −0.75; $BF_{10} = 3.59$]. DAS, Depression Anxiety Stress; D, Depression; A, Anxiety; S, Stress.

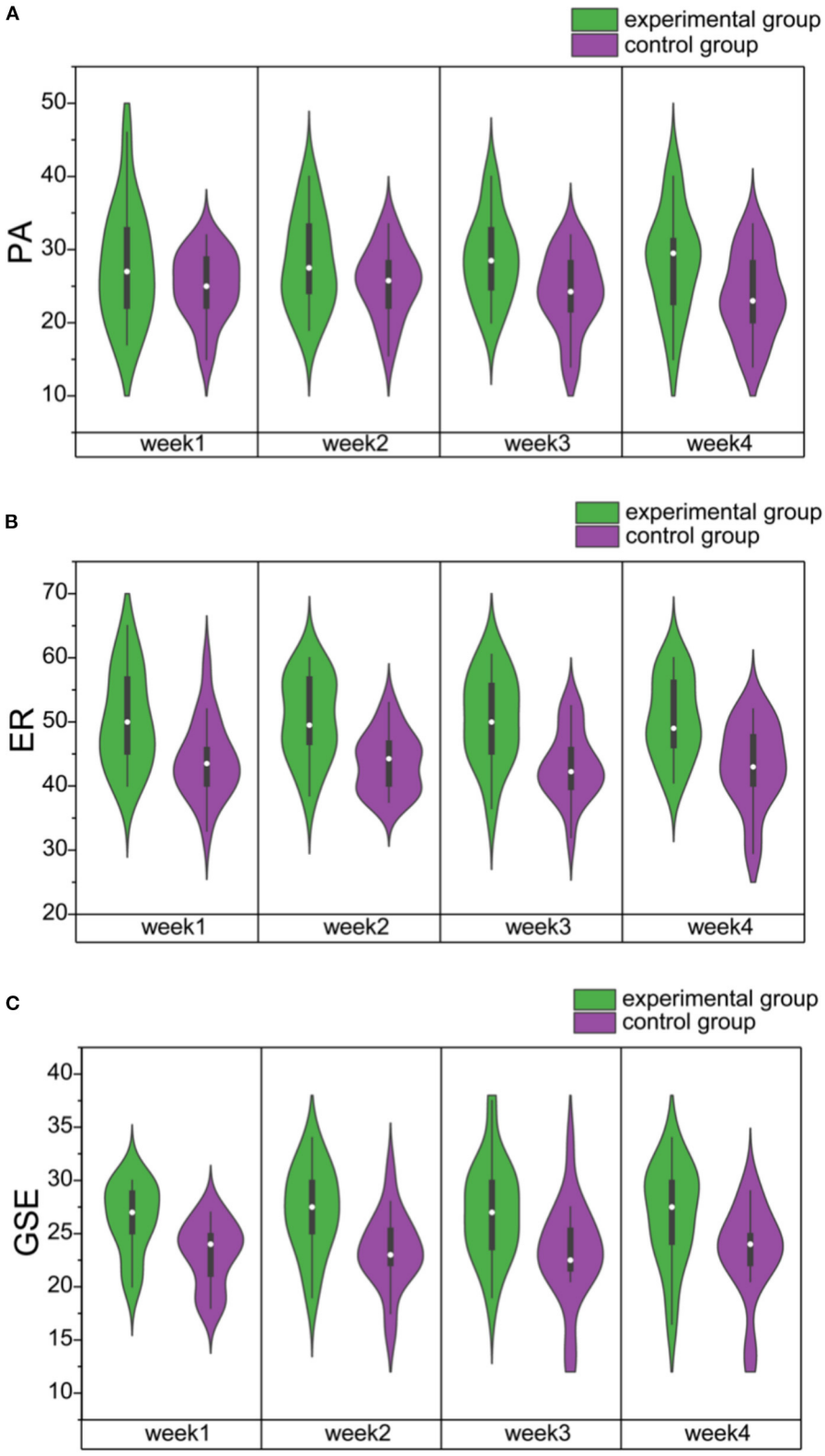

FIGURE 4
(A) The violin plots of PA scores for the experimental (green) and control (purple) groups during 4 weeks of video game training. **(B)** The violin plots of ER scores for the experimental (green) and control (purple) groups during 4 weeks of video game training. **(C)** The violin plots of GSE scores for the experimental (green) and control (purple) groups during 4 weeks of video game training. PA, Positive Affect; ER, emotional regulation; GSE, General Self-efficacy.

showed extreme evidence for the alternate hypothesis [$F_{(3,93)}$ = 9.02, p = < 0.01, η_p^2 = 0.23;BF_{10} = 7.556e+5). *Post-hoc* tests showed strong evidence for the alternative hypothesis of significant differences between the first and the fourth weeks [$t_{(32)}$ = 6.16, p < 0.01, Cohen's d = 0.55; BF_{10} = 311.72] and substantial evidence for the alternative hypothesis of differences between the experimental and the control groups [$t_{(32)}$ = − 1.36, p = 0.19, Cohen's d = −0.45; BF_{10} = 3.52]. Bayesian independent-sample *t*-tests for the alternative hypothesis (experimental group<control group) demonstrated that evidence that the experimental group alleviated symptoms more than the control group increased over time [week 1: $t_{(31)}$ = −0.46, p = 0.33, Cohen's d = −0.16; BF_{10} = 0.47; week 2: $t_{(31)}$ = −0.29, p = 0.39, Cohen's d = −0.10; BF_{10} = 0.41; week 3: $t_{(31)}$ = −2.26, p = 0.02, Cohen's d = −0.79; BF_{10} = 4.24; week 4: $t_{(31)}$ = −2.04, p = 0.03, Cohen's d = −0.72; BF_{10} = 3.03). Substantial evidence existed for the larger improvement in anxiety symptoms for the experimental group in weeks 3 and 4.

The stress scores (S) showed substantial evidence for the main effect of WEEK [$F_{(3,93)}$ = 6.29, p = <0.01, η_p^2 = 0.17; BF_{10} = 7.236] and anecdotal evidence for the main effect of GROUP [$F_{(1,31)}$ = 2.79, p = 0.11, η_p^2 = 0.08; BF_{10} = 1.11]. *Post-hoc* tests showed strong evidence for the alternative hypothesis of significant differences between the experimental and the control groups [$t_{(32)}$ = −1.67, p = 0.11, Cohen's d = −0.53; BF_{10} = 10.83], and substantial evidence for the alternative hypothesis based on the differences between the first and the fourth weeks [$t_{(32)}$ = 3.67, p = 0.01, Cohen's d = 0.43; BF_{10} = 5.99]. Bayesian independent-sample *t*-tests for the alternative hypothesis (experimental group<control group) showed that evidence that the experimental group alleviated symptoms more than the control group increased over time [week 1: $t_{(31)}$ = −0.39, p = 0.35, Cohen's d = −0.14; BF10 = 0.45; week 2: $t_{(31)}$ = −0.73, p = 0.24, Cohen's d = −0.26; BF_{10} = 0.60; week 3: $t_{(31)}$ = −2.48, p = 0.01, Cohen's d = −0.87; BF_{10} = 6.24; week 4: $t_{(31)}$ = −2.15, p = 0.02, Cohen's d = −0.75; BF_{10} = 3.59). Substantial evidence existed for the larger improvement in stress symptoms for the experimental group in weeks 3 and 4.

DAS score correlates negatively with general self-efficacy, positive emotions, and emotional regulation

Bayesian Pearson correlation analysis demonstrated association between all the four assessment scales across all the participants in the experimental group and the weeks (Table 4). There was extreme evidence for a positive correlation between GSE and ER (r = 0.605, p < 0.01, BF_{10} = 5.857e+4,) and a negative correlation between DAS and PA (r = −0.528, p < 0.01, BF_{10} = 1,527.176). Moreover, there was strong evidence for a positive correlation between GSE and PA (r = 0.420, p < 0.01,

TABLE 4 Bayesian pearson correlations between DAS, PA, ER, and GSE scores.

Variables		DAS	PA	ER	GSE
DAS	Pearson's r	—			
	BF10	—			
PA	Pearson's r	−0.528	—		
	BF10	1,527.176	—		
ER	Pearson's r	−0.343	0.298	—	
	BF10	5.452	2.206	—	
GSE	Pearson's r	−0.408	0.420	0.605	—
	BF10	26.638	36.878	58,568.231	—

BF_{10} = 36.878) and a negative correlation between GSE and DAS (r = −0.408, p < 0.01, BF_{10} = 26.638). Furthermore, there was substantial evidence for a negative correlation between DAS and ER (r = −0.343, p < 0.01, BF_{10} = 5.452) and anecdotal evidence for a positive correlation between ER and PA (r = 0.298, p = 0.02, BF_{10} = 2.206).

We then performed Bayesian ANCOVA to test the relationship between the four scales in the experimental group, with PARTICIPANT as a random effect and WEEK as a fixed effect. When DAS was considered as the dependent variable and the other three scales were considered as the covariates, the mixed effects model with WEEK and GSES was the best model (BF_{10} = 5.2946e+5 compared with the null model with only the subject). The 95% credible interval for the 4 weeks was provided by the reconstructed posterior model [week 1 (2.521, 6.015); week 2 (0.617, 3.884); week 3 (−4.553, −1.104); week 4 (−5.592, −2.125) and SE (−0.893, 0.123), Note the changes across weeks]. The ANCOVA correlation plots were visualized to demonstrate the mixed effects of week and GSES (Figure 5A). The slope of the graph was stable but the intercepts of the four lines decreased over weeks. This suggested that self-efficacy influenced depression, anxiety, and stress in the study participants across weeks.

Bayesian ANCOVA was also performed to evaluate the effects of general self-efficacy over the emotional assessment. When PA was considered as the dependent variable and the other three scales were considered as the covariates, the best model was the one with the main effects of GSE (BF_{10} = 59.06 compared with the null model with the subject only). We observed strong evidence for the effects of GSES on PA (BF_{incl} = 9.73). When emotional regulation was considered as the dependent variable and the other three scales were considered as the covariates, the model with the main effects of GSE was again the best model [BF_{10} = 2,371.12 compared to the null model with only the subject]. There was extreme evidence for GSE affecting ER (BF_{incl} = 450.88). The ANCOVA correlation plots for GSES vs. PA and GSES vs. ER are shown in Figures 5B,C, respectively.

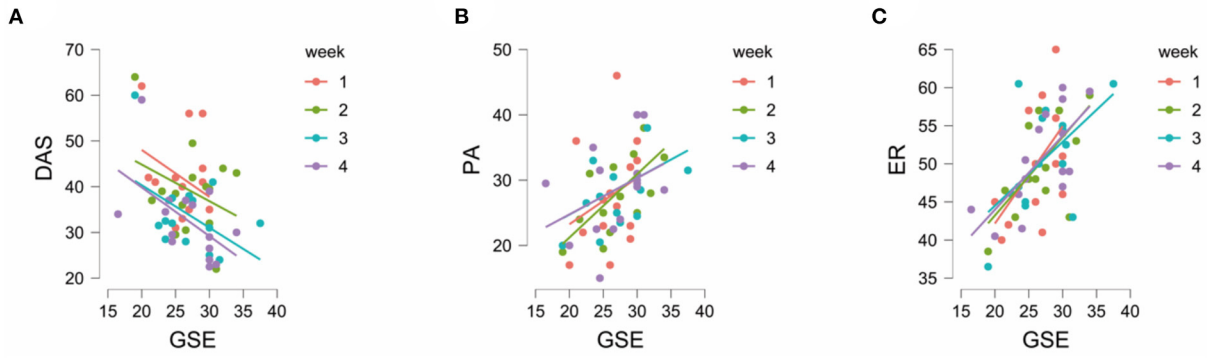

FIGURE 5
(A) The ANCOVA Correlation plots for GSES vs. DAS. **(B)** The ANCOVA Correlation plots for GSES vs. PA. **(C)** The ANCOVA Correlation plots for GSES vs. ER. DAS, Depression Anxiety Stress; PA, Positive Affect; ER, Emotional Regulation; GSES, General Self-Efficacy Score.

Discussion

This study demonstrated that 4 weeks of music-based video game training significantly alleviated anxiety, stress, and depression, as well as the total DAS scores in the experimental participants with subthreshold or mild depression. In contrast, the matched control group participants with subthreshold or mild depression did not show any significant changes in all the assessment during these 4 weeks. Moreover, the differences between the experimental and the control groups increased incrementally over the weeks of training. These results demonstrated the effectiveness of the music-based video game training program used in the study. General linear model analysis showed that the changes in DAS scores were dependent on the number of training weeks and the status of self-efficacy. This suggested that the music-based video game training significantly improved the cognitive functions, and then alleviated depression symptoms. Furthermore, improvements in self-efficacy positively affected the PA and ER scores, thereby suggesting that positive cognitive changes in response to music-based video game training led to better emotional states and emotional regulations.

Prior work has proved that casual video games improved the emotional state of individuals (48). In addition, video games with short duration and lower cognitive demands, such as Tetris, decrease the stress levels and improve the mood of players during the game resulting in physiological changes such as reduced heart rate variability and altered brain waves (49). The prefrontal lobe activity was significantly increased in the healthy elderly participants that underwent 1 month of video game training along with changes in the biomarkers associated with the antidepressant response (50). The present study further demonstrated that when music elements were included, our custom-designed music-based casual video game training significantly decreased the depression, anxiety, and stress scores in the training group.

However, previous studies did not reveal the mechanisms how casual video game training changed emotional states. Our results further demonstrated that music-based video games without high cognitive needs improved the depression, anxiety, and stress levels of the study participants with subthreshold or mild depression after only 1 month playing, by changing the cognitive state and improving positive emotions and the ability to regulate emotions.

We also found a negative correlation between DAS scores and self-efficacy. This result was consistent with the study of Bandura (51) that reported a relationship between negative emotions as well as depression and lower level of self-efficacy or outcome expectations. In addition, depression was found negatively correlated with induced self-efficacy (when the participants were told that their ability was high or low) (52). Our results demonstrate that music-based video game training can improve the emotional state of participants with subthreshold or mild depression by enhancing self-efficacy. In this music-based video game, the difficulty level was adjusted according to the skills of the study participants. For example, if the participant could hit the drop key correctly, the difficulty level of the game increased automatically and required greater attention and faster response speed from the player. When the hit rate of the player decreased, the difficulty levels of the game were automatically reduced. Moreover, the players were provided with immediate feedback. This process gave the participants a sense of control over the game, thereby improving their self-efficacy and reducing their negative emotions such as anxiety, depression, and stress.

The music used in this study has been widely used in multiple studies focused on affective disorders [depression (38) and anxiety (39)], ranging from popular to classical piano music.

Positive Emission Tomography (PET) studies demonstrated that music altered the brain regions associated with reward and emotions (53). Music increased resting-state cerebral blood flow (rCBF) in the left ventral striatum and dorsomedial midbrain, and decreased rCBF in the right amygdala, left hippocampal amygdala, and ventromedial prefrontal lobe (53). The activity of these brain structures was associated with reward and stimuli related to food, sex, and drug abuse (53). Therefore, the study participants enjoyed beautiful music during music-based video game training, which probably affected the brain areas related to pleasant emotions. This potentially suppressed the negative emotional states such as anxiety, depression, and stress and improved positive emotions.

During video game training, participants sometimes experienced positive emotions called "flow," which included being intensely focused on the task in hand, coordination of action and consciousness, and a feeling of being in control of one's actions (54). This increased the positive emotions (55) and reduced the anxiety levels (56). The sense of control generated by "flow" improved self-efficacy of the subthreshold or mild depression participants and was positively associated with positive emotions (20). This "flow" experience coincides with our findings that music-based video game training increases self-efficacy and subsequently improves the positive emotions of the study participants and reduces their depression, anxiety, and stress.

Previous studies demonstrated that music could further activated the areas of cognitive monitoring and emotional regulation in the brain (53, 57). The Music-based Emotional Regulation (MBE) theory for the elderly suggests that music improves emotional regulation by diverting the attention of the individual from negative events (58). Meanwhile, video games also improved emotional regulation (16) by enhancing cognitive control (15). Therefore, our protocol combining music and video game training successfully reduced depression, increased positive emotions and improved emotional regulation. On the contrary, emotional regulation is altered in individuals experiencing highly negative emotions (59). The protocol used in our experiment could potentially be beneficial for them.

It has been suggested that individuals with low self-efficacy were unable to adjust their emotions (60–62). Interestingly, our study demonstrated a positive correlation between self-efficacy and emotional regulation. Music-based video game training here increased self-efficacy, which could further affect cognitive reappraisal. Individuals with high self-efficacy are confident in their ability to overcome difficulties (63). This perception encourages them to solve problems effectively and reduces negative emotions such as depression, anxiety, and stress (22, 63).

To our knowledge, this is the first study to investigate the beneficial effect of music-based casual video game on reducing depression levels in young participants with subthreshold or mild depression. Previous games with music have mostly used music as background music. However, music in our study is set as a target what participants need to respond to. So, the engagement of participants in the music would be more profound. Classifying the degree of depression is debatable because of the existence of several states between the non-depressed state to the extremely depressed state (5, 64, 65). Mild or subthreshold depression significantly increases the risk of major depression in adolescents and adults (64, 66). Thus, timely treatment of depression is important. In comparison with the traditional treatments for depression, music games on mobile phones are portable, low-cost, and not limited by space and time.

This study has a few limitations. Firstly, although this study was pre-registered, and the study participants were recruited accordingly, as experiment progressed, several participants dropped off from the study, thereby reducing the sample size. The participants may have dropped out for the following reasons: (1) This game was a newly developed video game, and the amount of music (Strict Copyright investigation in Roblox platform) available to the players was not many (20 pieces of music for the first version). The visual presentation of this game is simple, and the player could not choose the game background, button shape, and others. Therefore, the game may have been boring during the month-long training period. Secondly, most of the recruited participants were college students. This may have resulted in sample bias. Finally, this study only focused on the behavioral results. In the future, neuroimaging technologies could be used to explore the neural mechanisms underlying the changes in depression, anxiety, and stress. Previous studies explored the effects of video games on brain plasticity in the elderly and adolescents. Thus, our findings might also be extended to different age groups.

In conclusion, our results demonstrated that training for 4 weeks with music-based casual video games promoted positive emotions and emotional regulation by improving self-efficacy, thereby decreasing depression, anxiety, and stress levels.

Data availability statement

The raw data supporting the conclusions of this article will be made available under reasonable request to the corresponding author YK.

Ethics statement

The studies involving human participants were reviewed and approved by the Institutional Review Board at the Sun Yat-sen University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

YK and TQ conceived and supervised the study. YK, XL, and LN designed the experiment. XL, MZ, and YZ carried out the experiment. YK and YZ analyzed the data. MZ, YZ, and YW drafted the first manuscript. All authors contributed to the revision of the manuscript.

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Conflict of interest

Author TQ was employed by Tencent Healthcare.

The remaining 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

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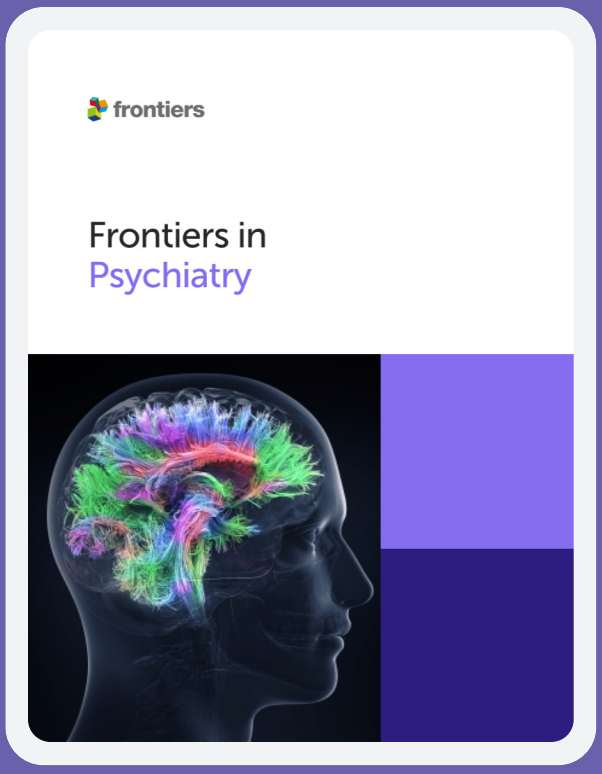

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