DIGITAL/ONLINE NETWORKS IN EVERYDAY LIFE DURING PANDEMICS

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DIGITAL/ONLINE NETWORKS IN EVERYDAY LIFE DURING PANDEMICS

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EDITORIAL
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Editorial: Digital/Online Networks in Everyday Life During Pandemics

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Editorial on the Research Topic

Digital/Online Networks in Everyday Life During Pandemics

This topic examines how sociocultural networks and platforms help to generate dynamic forms of culture associated with connectivity in everyday life during pandemics. Environment defines the peoples' lives and the COVID pandemic, as a global phenomenon has disrupted everyday reality and turned our attention in many directions (Abdel-Raheem, 2021; Kopecka-Piech and Łódzki, 2022). The viewpoints of the articles grouped in this issue are a good example of these everyday changes that are reflected in multiple aspects of peoples' lives. The collection has been generated from an interdisciplinary approach. Different theoretical perspectives coexist, and all the studies base their interpretations on the data, which are related to different points of view to the reality of life during the pandemic. They apply different methodologies, both quantitative and qualitative, and the need to look for new methods to replace personal contact with other forms of data collection is highlighted (Marzi, 2021).

The pandemic has generated *collective frames of interpretation*, figurative worlds that have conditioned the daily lives of people and researchers (Holland et al., 1998). This is the starting point of this editorial, the idea that these universes are filled with objects and actors to which meanings are attributed, collectively and culturally; they are dynamic and change according to events. Not all people perceive the situation in the same way, nor do the media or governments, or even researchers. Strategies of control, care and surveillance have been introduced; for example, Andrejevic et al. (2021) speak of careful surveillance, associated with different forms of power, to describe this context. Different reactions have been generated among people, sometimes sheltering at home for fear of the virus and sometimes protesting in the streets against controls that mark social distance, physical spaces, and people's daily lives. Moreover, these situations have also been guided both by social networks and by the traditional media, the press or television, very often focused on quantitative data that are difficult to interpret but which have the potential to generate panic (Milan, 2020; Arriaga et al., 2021).

The studies included below show the researchers' view of the world around them in a lockdown situation, also reinterpreted by the perspective of the editors. When this monographic issue was proposed, we were not sure what topics we would find. Today we have grouped them around three cores from which it is possible to establish relationships between the different contributions: first, digital technology as a mediator of everyday practices; second, changes in interpersonal relationships and in the contexts that delimit them; third, the role of social networks in times of pandemics.

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Digital technology has entered society in ways that would have been unthinkable only a short time ago. Physical spaces and tools have been transformed (Poom et al., 2020). The use of digital materials has come to the fore, changing leisure, everyday life, work or learning situations. In our view, four articles highlight this perspective. Vladova et al., *Students' Acceptance of Technology-Mediated Teaching* analyses the responses of German university students to technology in the context of different teaching models. The differences between disciplines emerge as a relevant variable to consider when considering the online use of technology in teaching and learning. For their part, Meier et al., *Alone Together: Computer-Mediated Communication in Leisure Time,* show leisure situations in which the computer mediates communicative situations as a means to avoid loneliness; in this case personality-related factors, e.g., introversion or extraversion, may or may not contribute to users' acceptance. The transformation of other leisure experiences more directly related to informal education, specifically in museums, is shown by Chen et al., *Participating in Online Museum Communities*; for these authors, experiences that occur outside the museum, through digital communities, contribute to improving visitors' experiences. Finally, Martínez-Borda et al., *Digital Narratives During the Pandemic,* analyse the interpretations of streaming television series during the most restrictive period of closure in Spain, in entertainment situations.

Social interactions have been transformed because people have lived indoors, living together for much longer than usual with those who, before the pandemic, probably only did so at certain times of the day (Newson et al., 2021). At the same time, situations of inequality (Brown and Zinn, 2021) associated with risk have been created, because people do not have the same material resources to cope with imposed circumstances (De Genova, 2021). Three contributions have focused on this context. León-Nabal et al., *Uses of Digital Mediation in the School-Families Relationship,* refer to situations of inequality through a qualitative study that shows educational inequalities; they emphasize the digital divide and how these differences mark the relationships between families and schools in times of pandemic. González-Ceballos et al., *Meaningful Learning Experiences in Everyday Life During Pandemics*, show how students have been forced to combine formal and informal educational experiences that were once far apart; these new experiences have transformed social interactions and the overall framework for learning. Finally, Nuñez-Gómez et al., *Critical Analysis of the Risks in the Use of the Internet and Social Networks in Childhood and Adolescence*, show the intergenerational differences, specifically between children and adults, regarding the risks of Internet use among young people.

Although in one way or another most of the studies presented allude to *social networks*, some make them the object of study, as they have become an extension of society that could not meet physically. Moreover, while governments are sending out messages through regulations or the classic media, people are looking for answers in social networks (LaPoe et al., 2021). A new social life is being experienced, in this case online, and new narratives associated with them are created (Petteway, 2020). Even those who spoke of the importance of disconnection (Kaun, 2021) have had the opportunity to approach new contexts in which connectivity becomes almost a form of survival. Three papers have been grouped around this core. Islam et al., *Understanding Knowledgeable Workers' Behavior Toward COVID-19 Information Sharing,* analyse people's motivations that lead them to share information. If in pre-pandemic situations the motives for using WhatsApp were related to leisure, now the motivations have been transformed: individuals do not share information for fun, but seek to disseminate authentic information. From a different perspective, Bowden-Green et al., *Personality and Motives for Social Media Use When Physically Distance,* found that people also use social networks to pass the time and maintain contacts that would otherwise take place on a personal basis. Finally Ye et al., *The Relationship Between Fear of COVID-19 and Online Aggressive Behavior,* analyse the role of social networks in the political and social context of China by looking at the presence of aggressive behavior, which users would justify as a way of being outside the rules in certain circumstances. To explain this they use the concept of moral disengagement.

In short, we are confronted with multiple perspectives from which to approach the pandemic in the social sciences, and there are many others that must undoubtedly be taken into account. The relevance of those presented here lies in the fact that the interpretations of a phenomenon as complex as COVID-19 are anchored in different types of data, obtained under difficult conditions that transformed people's personal and community lives.

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

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Understanding Knowledgeable Workers' Behavior Toward COVID-19 Information Sharing Through WhatsApp in Pakistan

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Using social media through mobile has become a major source of disseminating information; however, the motivations that impact social media users' intention and actual information-sharing behavior need further examination. To this backdrop, drawing on the uses and gratifications theory, theory of prosocial behavior, and theory of planned behavior, we aim to examine various motivations toward information-sharing behaviors in a specific context [coronavirus disease 2019 (COVID-19)]. We collected data from 388 knowledgeable workers through Google Forms and applied structural equation modeling to test the hypotheses. We noted that individuals behave seriously toward crisis-related information, as they share COVID-19 information on WhatsApp not only to be entertained and seek status or information but also to help others. Further, we noted norms of reciprocation, habitual diversion, and socialization as motivators that augment WhatsApp users' positive attitude toward COVID-19 information-sharing behavior.

Keywords: theory of planned behavior, COVID-19, information sharing behavior, social media, developing country, theory of prosocial behavior, theory of use and gratification

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INTRODUCTION

A decade ago, information about crises was first informed by the affected ones through mobile phones, then were reported on social media (Oh et al., 2011). Nowadays, social media has become a major and rapid source of improvising, communicating, and distributing information during crises (Zhao et al., 2016). This is because social media has shown a great potential to respond to affected people during crises. However, there remained a criticism on the accuracy and quality of the information provided through social media by the volunteers (Alexander, 2014). For instance, at the early stage of tragedy or crisis, complete information about crises may not be available, and if in such situations social media users keep on posting and reposting inaccurate information, these could result in serious damages. Indeed, social media is a quick source of distributing information or rumors compared with traditional media (Tripathy et al., 2013). In fact, while searching "false news about earthquake," one can find millions of fake news about the incident posted by citizens, and most of the news is there to create more panic about another imminent earthquake (Tanaka et al., 2013).

It does not necessarily mean that social media is only a source to spread false information during crises; in fact, it can be used as a channel to combat rumors. Zhao et al. (2016) noted that social media users first authenticate and then broadcast crises-related information. Similarly, Bird et al. (2012) also noted social media users' positive attitudes toward crises-related information sharing. In March 2011, when Japan was hit by an earthquake tsunami, social media (Twitter) was actively involved, as Stirratt (2011) noted 49% of the circulated information was either positive or somewhat positive, whereas only 7% of the information was negative or somewhat negative about the emergency response. The world is facing a similar kind of problem because of the new pandemic [coronavirus disease 2019 (COVID-19)]. The issue (COVID-19) is still new with lots of rumors on social media.

In December 2019, Hubei province in China captured the world's attention when pneumonia (lung disease) caused by a coronavirus emerged in Wuhan. The city of Wuhan is located in central China and is a key industrial and transportation hub with over 11 million population. At the beginning, it was believed that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is typically not transmissible to humans, as it has its origin rooted back to animals. However, in case of SARS, this virus is transmissible from animals to humans and humans to other humans. The severity of virus can be estimated by the fact that it took 3 months to reach the first 100,000 cases and only 12 days for another 100,000 cases (WHO, 2020).

Numerous misinformation is reported on several social media platforms regarding cure, prevention, outcomes, and etiology of the disease (Sandhya, 2020). Although these rumors are masking health behaviors, however, promoting erroneous practices is not only spreading the virus but also causing poor mental and physical health. For example, in India, a father of three kids was diagnosed with COVID-19 who then committed suicide (Joe, 2020). Similarly, after hearing about chloroquine (a drug primarily used to treat malaria), as a powerful drug to treat COVID-19 on media, several Nigerians were reported overdosed by their health minister (Busari and Adebyo, 2020). Similarly, the news of lockdown created panic regarding stationeries and groceries, which unbalanced demand–supply gaps and disrupted the supply chain in many countries (Spencer, 2020). These rumors largely affected individuals' psychological and physical health, thereby generating the need to study what motivates social media users to share such information.

Ji et al. (2014) used rumor dynamic theory and developed an anti-rumor model. Similarly, Tripathy et al. (2011) and Tripathy et al. (2013) also developed anti-rumor models (i.e., neighborhood, beacon, and delayed start models). These models were developed for social media through a technological perspective and thus are very complex to understand for a layman. However, studies suggesting anti-rumor models from a social–psychological perspective are scarce. For example, Zhao et al. (2016) developed a norm activation model based on the theory of planned behavior to understand social media users' information-sharing behavior, while Chen et al. (2018) extended this model by examining motivational factors toward such behaviors and suggested future researchers to identify more factors. In addition, past studies have highlighted the role of social media (mostly Facebook or Twitter) toward dissemination of crisis-related information (Tanaka et al., 2013; Zhao et al., 2016; Chen et al., 2018). However, studies on the factors that motivate social media users (WhatsApp) to share such information are limited. To fill in this gap, we selected WhatsApp users because statistics show that 29 million WhatsApp messages are sent every minute in Pakistan (Khan, 2020).

Moreover, past studies have identified entertainment, "individual's desire to experience emotions through online participation" (Park et al., 2009), information seeking, "seeking for information as a consequence of a need to satisfy some goal" (Lee and Ma, 2012), socialization, "talking with others to achieve a sense of community and peer support on the particular topic of the group" (Karnik et al., 2013), status seeking, "maintaining personal status, as well as of their friends, through the online group participation" (Malik et al., 2016), habitual diversion, "entertaining activity as an escape from reality or routine" (Krause et al., 2014), and norms of reciprocity, "repaying in kind what others have done for us" (Chen et al., 2018), as motivators for information-sharing behavior on social media. However, how these motivators work holistically during crises (COVID-19 in this study) and the benefits associated with these need to be shed light. Therefore, we aim at extending past studies by examining the roles of socialization, status seeking, norms of reciprocity, habitual diversion, information seeking, and entertainment (motivational factors) of WhatsApp users' attitudes toward COVID-19 information-sharing behavior. We used Batson's (1990) theory of prosocial behavior (TPSB), Ajzen's (1991) theory of planned behavior (TPB), and Katz et al.'s (1974) uses and gratifications theory (U&G) to develop a novel model toward social media sharing behavior of knowledgeable workers. In simple words, our study aims to examine:

(1) The role of socialization, status seeking, habitual diversion, information seeking, norms of reciprocity, and entertainment toward COVID-19 information-sharing behavior through WhatsApp (supporting from TPSB and U&G).

(2) How these factors affect the actual behaviors (TPB)

Uses and Gratifications Theory

According to U&G, individuals fulfill their gratifications by selecting specific media over alternatives. Literature has suggested U&G as the utmost significant theory that explains the determinants and meaning of social media users' behavior in the field of communication studies (Malik et al., 2016). Researchers started using U&G in explaining and identifying the motivations behind the use of traditional media. However, with the passage of time, traditional media was replaced by internet, which changed individuals' behavior of using social media. Few of the studies have used U&G to examine the users' motivations of using social media, such as Twitch, Snapchat, Instagram, Twitter, WeChat, and Facebook (Phua et al., 2017; Sjöblom et al., 2017; Chen et al., 2018). Kim and Yang (2017) argued that social media users use "share," "comments," "care," and "like/dislike" as communication

behaviors. Among these, "like/dislike" and "care" are driven by affect, whereas "comment" is driven by cognition. However, "share" is driven by both cognition and affection.

Krause et al. (2014) suggested that individuals highly motivate, involve, and devote when contributing something *via* social media, and their sharing depends upon communal incentive and self-interest (Fu et al., 2017). Indeed, content such as music (Krause et al., 2014), links (Baek et al., 2011), pictures (Malik et al., 2016), information regarding health (AlQarni et al., 2016), news (Lee and Ma, 2012), and crises-related information (Chen et al., 2018) matters while sharing on social media. Malik et al. (2016) identified information seeking, status seeking, and habitual diversion as gratification among 368 Facebook users while posting photos. Chen et al. (2018) identified norm of reciprocity, habitual diversion, and status seeking motivators for sharing crises-related information on WeChat. AlQarni et al. (2016) analyzed 1,551 Facebook posts on diabetes mellitus from the Arabic world to understand users' gratification. They concluded that most of the users post their personal experiences to create awareness as norms of reciprocity. Park et al. (2009) noted that most of the information-sharing activities on social media (Facebook) take place through group applications. They noted that most of the students use social media to seek information about civic activities, status seeking, and socializing, instead of political activities. Lee and Ma (2012) studied 203 students and identified that socialization and status seeking positively influence while entertainment and information seeking insignificantly associated with their intention to share information. According to Chen et al. (2018), factors that motivate social media users to share crises-related information need further attention. Therefore, we aim to examine how previously examined motivations (getting entertainment, seeking information, habitual diversion, status seeking, socialization, and norms of reciprocity) for information-sharing behaviors on social media can make a difference during COVID-19 outbreak with the assumption that getting entertainment may negatively affect said behaviors. According to Zhao et al. (2016), social media users may behave with maturity regarding sharing crises-related information. More specifically, Chen et al. (2018) studied 365 WeChat users and noted a negative influence of entertainment on attitudes toward behavior for crises-related information. We extend existing literature in two ways. First, past studies have examined these motivators with information-sharing intention (Park et al., 2009; Lee and Ma, 2012); we extend these studies and attempt to understand these motivators through TPB. Therefore, we examined these motivators' influence on attitudes toward behavior, subjective norms (SN), and perceived behavioral control (PBC). The motivators, i.e., getting entertainment, seeking information, habitual diversion, status seeking, socialization, and norms of reciprocity, help individuals to evaluate their favorable or non-favorable behaviors (PBC) (Park et al., 2009; Malik et al., 2016; Chen et al., 2018). Whereas status seeking and socialization can also affect individuals PBC (*an individual's perception about ease or difficulty to perform a behavior*) and SNs [*an individual's perception about whether his/her near ones (e.g., teachers, friends, peers, spouse, and parents) want him/her to behave in a specific manner*], given that individuals around us impact our beliefs about favorable situations. Specifically, we aim to examine whether the gratification of sharing COVID-19 information on social media identified by literature (in isolation) can impact WhatsApp users' attitudes toward information-sharing behavior, SNs, and PBC. Thus, we may hypothesize:

H1: Getting entertainment (a) has a negative impact, whereas seeking information (b), habitual diversion (c), status seeking (d), and socialization (e) have a positive impact, on WhatsApp users' attitudes toward COVID-19 information-sharing behavior.

H2: Seeking status (a) and socialization (b) have a positive impact on WhatsApp users' subjective norms about COVID-19 information-sharing behavior.

H3: Seeking status (a) and socialization (b) have a positive impact on WhatsApp users' perceived behavioral control toward COVID-19 information-sharing behavior.

Theory of Prosocial Behavior

We extend the literature by arguing that, in addition to gratification, individuals may voluntarily share COVID-19 information on WhatsApp for prosocial purposes (i.e., TPSB). According to Sanstock and Topical (2007), prosocial behavior includes obeying rules, cooperating, donating, sharing, helping, and complying to socially acceptable behaviors. However, social psychologists posit a different perspective behind individuals' prosocial behavior on social media. Morozov (2010) argued that social media users lack strong bonding, therefore, it may not be an essential platform for prosocial behavior, called "Slacktivism." In contrast, while studying Facebook and Twitter, Fatkin and Lansdown (2015) noted a significant association between exposure to social media and prosocial behavior. For example, Michelle Sollicito created a page "Snowed Out Atlanta" on Facebook to help people after sensing traffic gridlock, as a result, many open pages and groups were created to help people in snow disasters. Likewise, a page "blood donations of Hailey College of Banking and Finance" created many other open groups to help those who need blood in the country. Similarly, the concept of Black Friday by Americans was adopted by many other countries in the world (Fatkin and Lansdown, 2015). These findings show that, despite weak ties among users, social media can be a source of prosocial helping behaviors.

While exploring prosocial behavior, Eisenberg et al. (1998) identified social status, egoistic concerns, perceived fairness system, empathy toward others' welfare, and reciprocity as the motivations behind such behaviors. Pai and Tsai (2016) argued that norms of reciprocity may be the key motivating factor that impact individuals' information-sharing behavior. Norms of reciprocity is a universal norm that individuals must pay back to the one who helped them at the time of need (Gouldner, 1960). Literature is mixed while applying the concept of reciprocity on information-sharing behavior on social media. For example, Wasko and Faraj (2000) noted a negative, Wiertz and De Ruyter (2007) noted an insignificant, while Chang and Chuang (2011) noted a positive and significant association of norms of reciprocity with individuals' information-sharing behavior on social media. It can be inferred that the association

between norms of reciprocity and information-sharing behavior may depend on the context and conditions (Pai and Tsai, 2016). Following the same, we argue that in case of crises, WhatsApp users consider it their responsibility to share accurate and updated information to benefit sufferers, thus we may hypothesize:

H4: Norms of reciprocity have a positive impact on WhatsApp users' attitudes (a), subjective norms (b), and perceived behavioral control (c) toward COVID-19 information-sharing behavior.

Theory of Planned Behavior

According to Ajzen (2011), individuals' behavior is dependent upon their belief about controlling their behavior, perception about their near ones that they want them to perform a certain behavior, and/or they have a favorable attitude toward that behavior. Thus, TPB elucidates the inspiring and informational influence on individuals' behaviors. Researchers have been using TPB in the field of computers since the 1980s. However, few of the researchers have used this theory in explaining users' online behaviors, such as service and shipping usage (Lu et al., 2007), watching video (Cha, 2013), and shopping (Cheng and Huang, 2013). Later, researchers start using TPB in exploring individuals' behavior using social media such as privacy protection (Taneja et al., 2014), combating rumor (Zhao et al., 2016), crises information sharing (Chen et al., 2018), and location disclosure (Chang and Chen, 2014). Zhao et al. (2016) inculcates that social media-related behaviors can best be explained with the help of TPB. Given that, we aim to extend these studies by examining WhatsApp user's behavior during the COVID-19 pandemic through TPB. As discussed earlier, TPB explains an individual's behavioral intention (BI) through three aspects, i.e., "*attitude toward behavior, subjective norms, and perceived behavioral control*." According to Ajzen (2011), individuals first evaluate their behavior (favorable or not favorable) to develop their BI, called attitude toward behavior (ATB). We argue that COVID-19 information-sharing attitude impacts social media users' sharing intention. Following the same, we hypothesize:

H5: A positive attitude toward COVID-19 information sharing has a positive impact on WhatsApp users' intention to share COVID-19 information.

As per TPB, the second aspect that influences BI is SNs. SN refers to an individual's perception about whether his/her near ones (e.g., teachers, friends, peers, spouse, parents, etc.) want him/her to behave in a specific manner (Ajzen, 2011). In simple words, SN is an individual's perception about consent or condemnation of his behaviors by the majority (Amjad and Wood, 2009). Chang et al. (2014) noted that an individual's 63% of the variance of gameplay intentions was explained by SNs. Similarly, Bai et al. (2014) noted an individual's 57% of the intentions to continue hygienic food-handling behavior is explained by SNs. Particular to social media, Chen et al. (2018) also found SNs positively impacting on individuals' intention of sharing crises-related information. Therefore, we may hypothesize:

H6: Subjective norms have an impact on WhatsApp users' intention to share COVID-19 information.

According to TPB, PBC is the third aspect that impacts BI. This aspect varies across situations because it is an individual's perception about ease or difficulty to perform a behavior. Therefore, individuals when perceiving favorable situations would behave accordingly. Ajzen (2011) inculcates that PBC also has a tendency to impact individual's actual behaviors (AB). In particular, individuals have multiple sources to share information; however, we aim to examine how PBC predict WhatsApp users' actual and BI to share COVID-19 information. Thus, we hypothesize:

H7: Perceived behavioral control has a positive impact on WhatsApp users' behavioral intention (a) and actual behavior (b) of sharing COVID-19 information.

Literature has suggested that individual's BI positively affects their ABs in microblogging (Jiang et al., 2016) and transportation (Bamberg et al., 2007). Whereas others have identified a mixed result studying solar energy usage (Hai et al., 2017) and combating rumor (Zhao et al., 2016) and electronic waste (Echegaray and Hansstein, 2017). Thus, there is a need to further examine the association between BI and AB. We aim to examine whether intention to share COVID-19 information affects individuals' AB toward information sharing or not by hypothesizing:

H8: Behavioral intention has a positive impact on WhatsApp users' behavior of sharing COVID-19 information.

MATERIALS AND METHODS

Sample and Procedure

We collected data from the students of MBA executive because of the following reasons. First, we wanted to understand the behaviors of well-educated people toward COVID-19. Higher Education Commission of Pakistan has authorized universities that an applicant must have 16 years of education with a minimum of 2 years of work experience to be enrolled in MBA executive (which served the purpose). Second, although English is considered as the official language, still many of the employees remained unable to understand English (Raja et al., 2004; Islam et al., 2019, 2020a,b), thus educated people were selected as they can better respond to the questionnaires in English. Finally, during the lockdown, data collection was difficult in real settings.

We conducted an online survey where a link was shared on the WhatsApp groups of executive students. The students were noted to disseminate COVID-19-related information on these groups on a frequent basis. Further, few of the students or their family members were COVID-19 positive. The respondents were well explained about the purpose of this study and were ensured about the anonymity of their responses. Within 15 days, we received 394 responses out from 420 students. The data on all variables were collected from the same respondent; therefore, we followed the instructions of Podsakoff et al. (2012) to cope with the issue of common method variance (CMV). In addition, we also examined

Harman's single-factor test, and a single factor was found to have no more than 50% variance. The test supported the conclusion that CMV is absent.

We consider age, gender, qualification, and sector as control variables as these can have effects on respondents' attitudes and behaviors (Davis et al., 2019; Ahmad et al., 2020). According to gender, 84.5% (n = 328) of the respondents were male and 15.5% (n = 60) of the respondents were female, which represent the male-dominant culture of the country (Islam et al., 2020b). According to age, 46.4% (n = 180) of the respondents were between 31 and 40 years, 35.6% (n = 138) were less than 30 years, 12.4% (n = 48) were between 41 and 50 years, and only 5.7% (n = 22) were above the age of 50 years. Based on sector, 64.7% (n = 251) of the respondents were from the manufacturing sector, while 35.3% (n = 137) were from the service sector. Interestingly, 33.2% (n = 129) of the respondents were habitual WhatsApp users for at least 2 h/day, 30.4% (n = 118) use WhatsApp for 3 h/day, 19.3% (n = 75) use WhatsApp for 1 h/day, and 17.0% (n = 66) were using WhatsApp for more than 3 h/day.

Measures

We adapted questionnaires from the past studies and modified them according to the situation (COVID-19). Respondents responded using a five-point Likert scale (see **Appendix A**). We used six factors (i.e., norms of reciprocity, socialization, status seeking, habitual diversion, information seeking, and entertainment) about the reasons of participating in online discussions. Among these, questionnaires on four factors (i.e., self-status seeking, socialization, information seeking, and entertainment) comprised of three items for each factor were adapted from the study of Park et al. (2009), who reported their reliability ranges between 0.81 and 0.87. These factors were also validated by Chen et al. (2018) in the Southeast Asian context. Using the same factors, we noted its values of Cronbach's alpha ranges between 0.70 and 0.82. We adapted another three-item scale of habitual diversion from the study of Malik et al. (2016) and noted 0.71 as the value of its reliability. Finally, norms of reciprocity were measured through a three-item scale of Pai and Tsai (2016), and we noted 0.73 as the value of its reliability.

Information about (SN, ATB, PBC, AB, and BI was obtained through Ajzen's (1991) three-item scale for each. These scales have been validated by Oh et al. (2013), Han (2015), Zhao et al. (2016), and Chen et al. (2018). We noted 0.70, 0.79, 0.83, 0.86, and 0.83 as the values of its reliability, respectively (see **Appendix A**).

Statistical Analyses

We applied structural equation modeling (SEM) to test the hypotheses. The data were examined for the basis assumptions of SEM (e.g., missing values, outliers, normality, and multicollinearity). First, we conducted a confirmatory factor analysis (CFA) as we used validated scales. CFA was performed using AMOS version 24, applying maximum likelihood estimation. According to Mîndrilă (2010), in case of an ordinary scale, weighted least squares (WLS) parameter is best but only when data are asymmetric or show a high level of heteroskedasticity. The data for the study were examined for heteroskedasticity and found to be normally distributed; therefore, maximum likelihood method was used (Li, 2016). We followed Williams et al. (2009) for mode fit indices, Hair et al. (2018) for the values of factor loading, composite reliability, and average variance extracted, and Cronbach's alpha. We then examined Pearson correlation to examine the strength of bivariate relationships among variables. Finally, we examined the structural model to test the hypotheses.

RESULTS

We examined the hypotheses through SEM using AMOS. Therefore, first, the data were examined to fulfill their basic assumptions (i.e., missing values, outliers, normality, and collinearity).

Preliminary Analyses

The data (394 responses) were found to be free from missing values because they were collected through Google Forms and a condition of compulsory answer was applied. We applied Mahalanobis distance test at $P < 0.01$ to identify outliers; therefore, six were excluded (Hair et al., 2018). Regarding normality, the values of skewness and kurtosis (i.e., ± 1 and ± 3, respectively) were noted to be within range (Byrne, 2016). Finally, none of the correlation was found to be more than 0.85 (**Table 1**), which identifies the absence of collinearity in the data (Tabachnick and Fidell, 2019).

Descriptive Statistics

The results of descriptive statistics are presented in **Table 1**. The mean values show that the respondents agreed about five factors [i.e., norms of reciprocity (3.82), socialization (3.56), status seeking (3.60), habitual diversion (3.59), and information seeking (3.63)], whereas respondents disagreed about entertainment (1.68) as the reason for participating in online discussions during the COVID-19 pandemic. Further, they also agreed on SNs (3.83), ATB (3.56), perceived behavioral control (3.47), actual behavior (3.72), and behavioral intention (3.82). Moreover, the values of Cronbach's alpha of all the variables were also noted well above the standard value of 0.70 (Hair et al., 2018) (**Appendix A**). Further, we noted positive and significant correlations among variables used (r ranging between 0.32 and 0.67, $P < 0.05$), except entertainment as it was noted to have a negative correlation with other variables (r ranging between -0.30 and -0.59, $P < 0.01$).

Structural Equation Modeling

We followed Anderson and Gerbing (1998), and SEM was applied in two stages where, first, CFA was conducted to examine the measurement model (11-factor model as all the factors were included while examining the measurement model) because scales used by us were adapted; second, the structural model was examined. We used "chi-square/degree of freedom ($x^2/df \leq 3.0$), Tucker–Lewis index (TLI ≥ 0.90), comparative fit index (CFI ≥ 0.90), goodness-of-fit index (GFI ≥ 0.90), root mean residual (RMR ≤ 0.10), and root mean square error of approximation (RMSEA ≤ 0.08)" for model fit, as suggested by Williams et al. (2009) and found our model fit, i.e., x^2/df

TABLE 1 | Results of correlation, mean, and standard deviation.

Variables	1	2	3	4	5	6	7	8	9	10	11
(1) Norms of Reciprocity (NOR)	1										
(2) Socialization	0.59**	1									
(3) Status Seeking (SS)	0.55**	0.67**	1								
(4) Habitual Diversion (HD)	0.63**	0.60**	0.58**	1							
(5) Information Seeking (IS)	0.54**	0.58**	0.53**	0.51**	1						
(6) Entertainment	−0.44**	−0.30**	−0.38**	−0.40**	−0.42**	1					
(7) Subjective Norms (SN)	0.45**	0.33**	0.35**	0.43**	0.38**	−0.47**	1				
(8) Attitude Toward Behavior (ATB)	0.58**	0.43**	0.37**	0.48**	0.40**	−0.38**	0.31**	1			
(9) Perceived Behavioral Control (PBC)	0.55**	0.53**	0.50**	0.50**	0.49**	−0.55**	0.41**	0.53**	1		
(10) Actual Behavior (AB)	0.46**	0.33**	0.38**	0.40**	0.32**	−0.53**	0.49**	0.43**	0.53**	1	
(11) Behavioral Intention (BI)	0.56**	0.45**	0.47**	0.49**	0.44**	−0.59**	0.49**	0.47**	0.61**	0.63**	1
Mean	3.82	3.56	3.60	3.59	3.63	1.98	3.83	3.56	3.47	3.72	3.82
Standard Deviation	0.71	0.70	0.74	0.75	0.71	0.68	0.65	0.79	0.82	0.84	0.81

(981.248/440) = 2.23, TLI = 0.90, CFI = 0.91, GFI = 0.90, RMR = 0.039, RMSEA = 0.056, and P-Close = 0.014. Further, we followed Hair et al. (2018) to examine loading (i.e., ≥0.50), average variance extracted (i.e., ≥0.50), and composite reliability (i.e., ≥0.60) and noted that our scales fulfilled the criteria (see **Appendix A**).

Hypotheses Testing

Results generated through the structural model (maximum likelihood parameter estimation) are presented in **Figure 1** and **Table 2**. The structural model was found to be fit, i.e., x^2/df (1,077.551/465) = 2.31, TLI = 0.92, CFI = 0.93, GFI = 0.92, RMR = 0.044, RMSEA = 0.058, and P-Close = 0.001. The values revealed that entertainment negatively impacts (β = −0.14, CR = −3.190, P = 0.001), habitual diversion (β = 0.15, CR = 3.447, P = 0.000), socialization (β = 0.11, CR = 2.497, P = 0.013), and norms of reciprocity (β = 0.42, CR = 9.563, P = 0.000) positively impact, whereas seeking information (β = −0.04, CR = 0.901, P = 0.368) and status seeking (β = −0.07, CR = −1.548, P = 0.122) insignificantly impact on WhatsApp users' attitudes toward COVID-19 information-sharing behavior. These findings support H1a, H1c, H1e, and H4a and rejects H1b and H1d, respectively. The values further show that seeking status (β = 0.14, CR = 3.011, P = 0.003), socialization (β = 0.13, CR = 2.786, P = 0.000), and norms of reciprocity (β = 0.37, CR = 7.899, P = 0.000) were also noted to have a positive impact on WhatsApp users' SNs about COVID-19 information-sharing behavior. These results support H2a, H2b, and H4b, respectively. Similarly, seeking status (β = 0.19, CR = 4.144, P = 0.000), socialization (β = 0.25, CR = 5.609, P = 0.000), and norms of reciprocity (β = 0.36, CR = 8.131, P = 0.000) were also noted to have a positive impact on WhatsApp users' perceived behavioral control toward COVID-19 information-sharing behavior. These results support H3a, H3b, and H4c, respectively.

The results further revealed that ATB (β = 0.17, CR = 2.646, P = 0.008), SNs (β = 0.24, CR = 6.425, P = 0.000), and perceived behavioral control (β = 0.55, CR = 14.506, P = 0.000) positively impact WhatsApp users' intention to share COVID-19 information. Finally, perceived behavioral control (β = 0.16, CR = 3.103, P = 0.002) and behavioral intention (β = 0.49, CR = 9.180, P = 0.000) were also found to predict WhatsApp users' actual behavior toward COVID-19 information. These results support H5, H6, H7a, H7b, and H8, respectively.

DISCUSSION

The aim of this study was to develop and understand a model about the motivations toward WhatsApp users' COVID-19 information-sharing behavior in a developing country. We consider the framework of TPB and extend with the help of TPSB and U&G. We examined hypotheses on 388 responses collected during the COVID-19 pandemic through an online survey. Unlike past studies, the findings of this study are interesting. For example, past studies confirmed that most of the social media users (especially mobile) consider social media a source of entertainment (Leggatt, 2011). Tsang et al. (2014) noted that entertainment positively associated with users' ATB. On the other hand, Lee and Ma (2012) identified an insignificant association between entertainment and information-sharing behavior. Further, Chen et al.'s (2018) findings revealed a negative association between entertainment and attitude toward information sharing. Similarly, information seeking and status seeking also show a mixed result. For example, Malik et al. (2016) identified that social media users share information (photos) for information seeking and status seeking, while Chen et al. (2018) identified a non-significant association of status seeking and information seeking with ATB. It can be inferred that motivating factors impact individuals' information-sharing behavior differently in different contexts, i.e., situation, culture, etc. (Fu et al., 2017). Considering the situational factor (i.e., COVID-19), we noted that individuals do not share COVID-19 information on WhatsApp to be entertained. Precisely, individuals respond to crises with a serious attitude and try to disseminate authentic information (Chen et al., 2018). Contradicting previous studies, we further noted that information and status seeking does not motivate individuals toward information sharing during the COVID-19

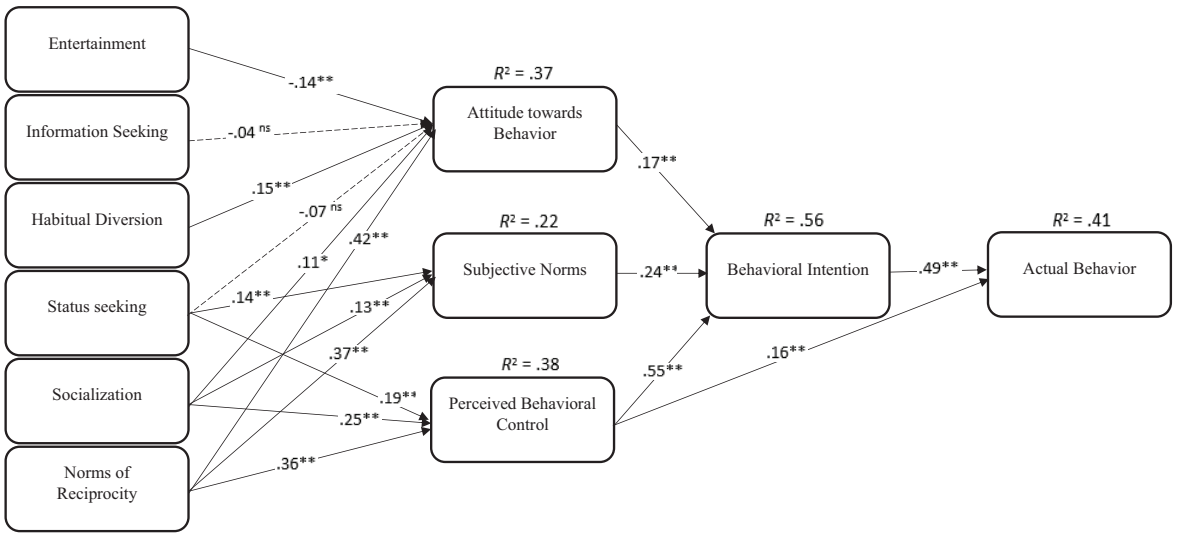

FIGURE 1 | Structural model.

TABLE 2 | Results of hypotheses testing.

Hypotheses	Standardized β	CR	SE	*P*	Result
Entertainment→Attitude Toward Behavior	−0.14	−3.190	0.046	0.001	H1a is accepted
Information Seeking→Attitude Toward Behavior	−0.04	0.901	0.045	0.368	H1b is rejected
Habitual Diversion→Attitude Toward Behavior	0.15	3.447	0.043	0.000	H1c is accepted
Status Seeking→Attitude Toward Behavior	−0.07	−1.548	0.043	0.122	H1d is rejected
Socialization→Attitude Toward Behavior	0.11	2.497	0.045	0.013	H1e is accepted
Norms of Reciprocity→Attitude Toward Behavior	0.42	9.563	0.043	0.000	H4a is accepted
Status Seeking→Subjective Norms	0.14	3.011	0.040	0.003	H2a is accepted
Socialization→Subjective Norms	0.13	2.786	0.042	0.000	H2b is accepted
Norms of Reciprocity→Subjective Norms	0.37	7.899	0.042	0.000	H4b is accepted
Status Seeking→Perceived Behavioral Control	0.19	4.144	0.044	0.000	H3a is accepted
Socialization→Perceived Behavioral Control	0.25	5.609	0.047	0.000	H3b is accepted
Norms of Reciprocity→Perceived Behavioral Control	0.36	8.131	0.046	0.000	H4c is accepted
→Attitude toward BehaviorBehavioral Intention	0.17	2.646	0.039	0.008	H5 is accepted
Subjective Norms→Behavioral Intention	0.24	6.425	0.042	0.000	H6 is accepted
Perceived Behavioral Control→Behavioral Intention	0.55	14.506	0.038	0.000	H7a is accepted
Behavioral intention→Actual Behavior	0.49	9.180	0.058	0.000	H8 is accepted
Perceived Behavioral Control→Actual Behavior	0.16	3.103	0.057	0.002	H7b is accepted

CR represents t-value. SE, standard error; P, significance.

pandemic. This may be because individuals primarily focus on the pandemic (crisis) and want to be assured before sharing the same information on social media as they prefer to combat rumors (Zhao et al., 2016). In line with literature, we also noted socialization, habitual diversion, and norms of reciprocity as motivating factors for "attitudes toward information-sharing behavior."

Past studies have identified socialization, status seeking, and norms of reciprocity as the motivational factors for SNs; we identified the same for perceived behavioral control as well. This finding suggests that WhatsApp users use prosocial behaviors regarding sharing information, rather than being just rumor mills (Hjorth and Kim, 2011). This finding can be justified by arguing, although status seeking, and socializing is considered bad during the pandemic; still, the desire to connect with others to get helpful information overcomes the fear of information sharing. According to Kim (2014), individuals are prone to anxiety when they feel isolated or find themselves with lack of sufficient information. However, having themselves equipped with timely information may help them in getting out of the state of anxiety. Regarding norms of reciprocity, individuals consider it their responsibility to pay back to the society by sharing pandemic-related information on WhatsApp.

Finally, consistent with the TPB, we noted that ATB, SNs, and perceived behavioral control positively predict WhatsApp users' behavioral intention and actual behavior toward

COVID-19-related information. This finding suggests that WhatsApp users who feel an obligation have a positive attitude toward others and are more confident about sharing information and are more likely to be involved in sharing COVID-19 information with others. Replying to the contradictory results (Zhao et al., 2016), we identified behavioral intention as the predictor of actual behavior. Thus, TPB, U&G, and TPSB fit to understand WhatsApp users' information-sharing behavior during the COVID-19 pandemic.

Implications and Limitations

The findings of our study contribute theoretically and practically. First, most of the previous studies regarding information-sharing behavior have been conducted in western countries where Twitter or Facebook remained their prime focus. However, the prime focus of our study was to understand the individuals' information-sharing behavior during COVID-19 in a non-western context. Second, past studies mostly have studied generic information-sharing behaviors (e.g., Zhao et al., 2016; Chen et al., 2018), whereas we examined the same in a specific context (COVID-19) and found contradictory results, which generated the need to further understand social media users' information-sharing behavior along with their motivations. Third, as we investigated the relationship between motivations and information sharing, therefore, the findings of our study may likely benefit academicians, policy makers, and all other related stakeholders. Finally, our study extends the existing literature about information sharing in the field of behavioral research by combining TPSB, U&G, and TPB.

This study suggests practitioners to handle crises by understanding that educated individuals in developing countries are very serious regarding disseminating crises-related information. They do not share information to be entertained or seek status, but to be socialized as to alleviate their anxiety and tension by sharing crisis-related information (COVID-19 here). Further, educated social media users feel that it is their responsibility to share crisis-related information with others for their betterment and to combat rumors. Given that, healthcare professionals should release relevant and sufficient information on social media through different channels, such as WhatsApp, Twitter, Facebook, or Snapchat, etc. While doing so, disseminating misleading information may be prevented.

Despite implications, the study has few limitations. First, we collected data from highly educated individuals using WhatsApp, which may raise a question on its generalizability to other populations as the results might be different considering less educated individuals and other social media channels. Second, most of the respondents of this study were male, which may raise a question of gender bias results. Therefore, future researchers are suggested to have equal representation of both male and female participants. Third, the data on independent and dependent variables were collected from the same source, which may generate biased results; therefore, future researchers are suggested to collect data as dyads (i.e., user and his/her colleague). In addition, such data restrict the researchers to identify the exact direction. Fourth, there exists a gap in the measures used as some of the questions are about sharing COVID information, while others are about sharing authentic COVID information. Finally, we used motivations based on U&G and TPSB; future researchers are suggested to identify other unexplored motivations toward information-sharing behavior.

CONCLUSION

Drawing upon the U&G, TPSB, and TPB, we examined a model to understand the motivations that impact social media (WhatsApp) users while sharing COVID-19 information. We noted that social media users do not share crises-related information to be entertained or for information seeking and status seeking. They behave with maturity and consider their responsibility to share authentic information during crises. The findings of this study suggest that healthcare professionals share relevant information on social media for further dissemination. Such policies would not only help victims in adopting accurate precautionary measures but also help to combat rumors.

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 Institute of Business Administration, University of the Punjab. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

TI developed the manuscript, collected the data, and conducted the analysis. KM initiated the idea. MS helped in incorporating suggested changes, while BU and SY gave the manuscript a final proofread. All the authors contributed to the article and approved the submitted version.

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APPENDIX

APPENDIX A | Questionnaire.

Variables of the study	λ	CR	AVE	α
Entertainment (Park et al., 2009) [1- strongly disagree to 5- strongly agree]				
E1: Sharing COVID-19 information through WhatsApp is entertaining for me.	0.76	0.82	0.61	0.82
E2: Sharing COVID-19 information through WhatsApp is fun for me.	0.84			
E3: Sharing COVID-19 information through WhatsApp is exciting for me.	0.72			
Information seeking (Park et al., 2009) [1- strongly disagree to 5- strongly agree]				
IS1: I share COVID-19 information through WhatsApp to get useful information through other's feedback.	0.72	0.81	0.59	0.72
IS2: I share COVID-19 information through WhatsApp to get other's opinion through their feedback.	0.82			
IS3: I share COVID-19 information through WhatsApp to learn more about pandemic.	0.76			
Status seeking (Park et al., 2009) [1- strongly disagree to 5- strongly agree]				
SS1: I share COVID-19 information through WhatsApp, because I want others to perceive me as sociable.	0.71	0.74	0.50	0.70
SS2: I share COVID-19 information through WhatsApp, because I want others to perceive me as knowledgeable.	0.65			
SS3: I share COVID-19 information through WhatsApp, because I want others to perceive me as valuable.	0.74			
Socializing (Park et al., 2009) [1- strongly disagree to 5- strongly agree]				
SO1: I share COVID-19 information through WhatsApp to share something with others.	0.73	0.77	0.53	0.76
SO2: I share COVID-19 information through WhatsApp to stay in touch with people I know.	0.77			
SO3: I share COVID-19 information through WhatsApp to feel like I belong to a community.	0.69			
Habitual Diversion (Malik et al., 2016) [1- strongly disagree to 5- strongly agree]				
HD1: I share information through WhatsApp as it is a part of my routine.	0.67	0.76	0.54	0.71
HD2: I share information through WhatsApp as it is one of my habits.	0.72			
HD3: I cannot stop myself sharing information through WhatsApp.	0.79			
Attitude Toward Behavior (Chen et al., 2018)				
ATB1: For me, sharing information about COVID-19 through WhatsApp is: (1-Bad to 5-Good)	0.69	0.80	0.57	0.79
ATB2: For me, sharing information about COVID-19 through WhatsApp is: (1-Foolish to 5-Wise)	0.80			
ATB3: For me, sharing information about COVID-19 through WhatsApp is: (1-Harmful to 5-Beneficial)	0.77			
Perceived Behavioral Control (Zhao et al., 2016) [1- strongly disagree to 5- strongly agree]				
PBC1: I think it's easy for me to share COVID-19 information though WhatsApp.	0.75	0.83	0.62	0.83
PBC2: I am confident enough, if I want to share COVID-19 information though WhatsApp, I can.	0.80			
PBC3: I have time, resources and knowledge to share COVID-19 information though WhatsApp.	0.81			
Subjective Norms (Cheung and To, 2016) [1- strongly disagree to 5- strongly agree]				
SN1: My friends would think I should share information about COVID-19 through WhatsApp.	0.76	0.81	0.58	0.70
SN2: My family would think I should share information about COVID-19 through WhatsApp.	0.73			
SN3: My colleagues would think I should share information about COVID-19 through WhatsApp.	0.81			
Behavioral Intention (Zhao et al., 2016) [1- strongly disagree to 5- strongly agree]				
BI1: I will verify the authenticity of information about COVID-19 before sharing through WhatsApp.	0.80	0.83	0.63	0.83
BI2: I am willing to refute rumors about COVID-19 on WhatsApp.	0.83			
BI3: I will make efforts to refute rumors about COVID-19 on WhatsApp.	0.73			
Actual Behavior (Oh et al., 2013) [1- strongly disagree to 5- strongly agree]				
AB1: During pandemic (COVID-19), I transmitted information through authentic institutions.	0.78	0.87	0.68	0.86
AB2: During pandemic (COVID-19), I had only transmitted information with external source interlinkage.	0.84			
AB3: During pandemic (COVID-19), I had confirmed the authenticity of information before sharing through WhatsApp.	0.85			
Norms of Reciprocity (Pai and Tsai, 2016) [1- strongly disagree to 5- strongly agree]				
NOR1: I would feel an obligation to share COVID-19 information with others to help them be informed.	0.76	0.83	0.62	0.71
NOR2: When I receive COVID-19 information from others through WhatsApp, feel it right to share out to help others.	0.79			
NOR3: I would feel an obligation to spare time from my schedule to share COVID-19 information within WhatsApp community, if it needed that information.	0.81			

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Participating in Online Museum Communities: An Empirical Study of Taiwan's Undergraduate Students

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With the worldwide spread of the Internet, human activity has become permeated by digital media, which shapes communication and interaction and speeds up the improvement of the experience and diffusion of museum exhibitions. Contemporary museums must understand their audiences, especially with respect to online preferences and surfing involvement experiences. Museums are changing in an effort to attract young netizens to access and use museum resources. Virtual museums are increasingly using digital exhibitions to preserve and apply their collections and establishing online community platforms to interact with young people. This study investigates the underlying mechanism of online community characteristics that enhance audiences' emotional resonance and involvement. Results from a questionnaire survey (N = 1168) of Taiwan undergraduate students show that perceived relevance and esteem improve their emotional resonance, which can attract new people and maintain existing relationships within their communities. Following flow theory, maintaining community relationship characteristics increases emotional resonance, which, in turn, enhances user involvement, but we found only small significant effects of emotional resonance on involvement. These findings illuminate the mechanism of the attitudinal relationship building and maintenance for online museum communities and advance the practical contributions of online museum community use and effects.

Keywords: emotional resonance, flow theory, social interaction, user involvement, online museum community

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INTRODUCTION

Over the last two decades, researchers have attempted to understand and improve several aspects of audience online and off-line experiences, including identifying factors that motivate individuals to visit museums, elements of the visit that influence their overall satisfaction, what is retained following their visit, ways online visitors' website experiences can be improved, and understanding how all of these combine to encourage visits to museum websites. Museum exhibitions are usually the main channel for education promotion. For museum staff, the main tasks associated with this include understanding more about the online-addiction characteristics of the young, constructing an interesting and interactive museum environment, and increasing involvement in museums (Kabassi, 2017; Roberts and Lyons, 2017). Increasingly, audiences are using social media for a variety of information sharing and online activities (Chi, 2011; Sawyer et al., 2011; Taylor and Gibson, 2017; Pulh et al., 2019). For example, museum audiences understand how to disseminate valuable information and playfulness activities through their own blogs or on social media tools

to connect, interact, and share resources with members who have similar interests (Sundar et al., 2015). In the United States, museums have used social media as a marketing channel since the early 2000s, transforming the traditional interaction modes between visitors and exhibits (Roberts and Lyons, 2017). However, although many audiences perceive the value of online communities and expect social media to exhibit a positive impact on formal involvement, the relationships between audiences, social media, and online communities are complex (Csikszentmihalyi et al., 2014; Johnson et al., 2014). It is clear that museum websites serve as important ways to disseminate information. In particular, a growing body of literature is focused on how to encourage online visitors to also visit physical museums to enhance their experience: Increasing online and off-line museum visits is a powerful way to support visitors' interest and satisfaction (Allen and Crowley, 2014; Siglioccolo et al., 2016; Kabassi, 2017; Falk et al., 2018). Although much attention has been paid to face-to-face interactions with visitors and physical exhibitions within museum settings, little research has focused specifically on online audiences' museum experiences and management. Because of a lack of benchmark practical cases related to the management of complex museum online communities within digital contexts, additional research is required to better understand how museum online communities can attract online audiences' interest (Camarero et al., 2018). Museum administrators must weigh the benefits and risks of implementing advanced website and interaction technologies as few museums possess true expertise in the design, development, and maintenance of online communities.

Web 2.0 has redefined the role of museums: hybrid mobile devices allow museums to widen their scope from collections and hardware to digitally generated content and take advantage of Internet-based technology (King et al., 2016; Matuk, 2016; Kabassi, 2017; Roberts and Lyons, 2017). Today, people recognize the importance of digital museum exhibitions in society and making significant contributions to cultural development, education, the content of their physical collections, and overall museum promotion (Russo et al., 2009; Charitonos et al., 2012; Marín-Morales et al., 2019). Museums emphasize direct involvement, personal discovery, and co-creative activities, which encourage interaction with the physical exhibits; this can also use advanced technology to extend to the online environment (Guazzaroni, 2020; Sylaiou et al., 2020). Social media technologies provide new experiences and ways to engage public interest in exhibitions. They offer museum visitors greater cognitive, emotional, and intellectual stimulation, thus changing the way people view, learn, experience, and interpret collections (Dudley, 2017; Falk et al., 2018; Sylaiou et al., 2020). Studies have identified several individual and contextual factors that may influence online communities' interest, including their prior knowledge and interests, electronic learning materials, digital exhibits and displays, and online social interactions (Csikszentmihalyi and Hermanson, 1995; Dohn, 2011; Nimrod, 2017; Falk et al., 2018; Guazzaroni, 2020). Museum online communities differ from mainstream museums in that their objective comprises both digitizing collections and artifacts and soliciting opinions and building online interactions (Russo et al., 2009; Ch'ng et al., 2019; Guazzaroni, 2020). Online communities may be particularly significant for audiences as they enable interaction and expression of enduring interest through the digital environment (Sylaiou et al., 2010; Sundar et al., 2015; Kim, 2018). This type of online, active engagement plays a critical role in assuring conviviality in real life (Charitonos et al., 2012; Camarero et al., 2019). This observation supplements the considerable evidence of the positive effects of online community involvement on users' well-being and knowledge growth (King et al., 2016; Morse et al., 2016; Nimrod, 2017).

People engage in museum online communities to make life richer, more wonderful, and more meaningful, but Csikszentmihalyi et al. (2014) observe that enjoyable experiences that make users produce flow have a potentially addictive negative effect. Csikszentmihalyi et al. (2014) note that flow is experienced when individuals fully engage themselves in specific activities, including lack of awareness of time, loss of awareness of the real world, and involvement and a sense of being in the specific environment were flow negative features. Further exacerbating the issue of advanced website and interaction technology risk is the fact that museums are undergoing significant changes in marketing philosophy and online community management. Thus, it is important to consider what types of foundational attraction methods and technologies that the managers prefer (Barker, 2015; Sundar et al., 2015; King et al., 2016; Kim, 2018). Involvement and user experience for visitors are mainly investigated when hybrid reality (including augmented virtuality and reality) or virtual reality technologies play a major role in enabling the connection between visitors and virtual exhibitions (Nah et al., 2011; Pietroni et al., 2018; Ch'ng et al., 2019; Marín-Morales et al., 2019). Social media enables greater interaction and enjoyment as well as joint exploration and discussion between people who are almost all strangers. Knowing how participants perceive the community advantages associated with online museums and the information and experience they can gain during visits can assist managers in determining how to implement online communities of practice (Morse et al., 2016; Dudley, 2017). This research addresses the urgent need of contemporary museums to understand online audiences, specifically regarding their preferences and reactions to website experiences.

Research question 1: We focus on museum visitors participating in the museum online community: How we can make it happen, and how we can manage it to both enhance the online community and evaluate its use?

Research question 2: We attempt to identify the psychological factors that can improve the online interactive design of museum websites and engage audiences, using community involvement as the dependent variable.

THEORETICAL FOUNDATIONS

Museum Online Communities

Damala et al. (2008) note that, as mobile devices became more powerful, they could be used as new platforms for the interpretative materials to which the visitor is exposed during and

after the visit. This, in turn, redefined the relationship between "real" objects and their digital representations: using this two-way communication channel helped to build new online communities out of audiences (Reeve and Woollard, 2016; Lammes, 2017). Geographic location does not constrain participants as physical proximity is not required for bonds to be established: technology creates a new way for communities in which local and global contexts can overlap. Online museum community members are people who love museum collections, and exhibitions shape the way the self is presented, emphasize, or deemphasize certain aspects of their selves to create a desired online impression (Morse et al., 2016; Kim, 2018; Legget, 2018). In user content created worlds, the structure of the online communities can either create or help develop active participation, which allows members to quickly extract interesting, well-organized materials from public information, often leading to the formation of an online community of like-minded individuals (Chi, 2011; Johnson et al., 2014; Siglioccolo et al., 2016; Shin, 2018). In these online communities, participants often ask questions about museum exhibition subjects and are provided with immediate feedback by co-participants, creating a self-initiated and feedback organism (Nah et al., 2011; Ch'ng et al., 2019). Community citizenship typically instructs people to use these social network technologies responsibly to engage in artistic, community, and museum management activities.

According to Hidi and Renninger (2006), people with a developed interest in a subject possess greater knowledge of that subject, value the content more, and are usually more willing to participate in activities than people with an emerging interest. Reviewing the literature, Knogler et al. (2015) indicate that the social interaction between individual and situational interest is positive. Individual interest is consistently rated as an important factor because audiences often have different levels of interest in and knowledge of exhibition subjects. Online communities pursue common values and goals, which depend on continued interactions (Huang et al., 2014; Taylor and Gibson, 2017). These social practices matter in modern societies because they create, hold, and disseminate knowledge and establish competency standards in specific areas (Russo et al., 2009; Sawyer et al., 2011; Jafari et al., 2013; Shaw and Krug, 2013; Lammes, 2017).

Flow Theory

Subjective experience consists of unique areas of cognition, perception, and emotion, all of which are highly relevant to involvement activity, characterized by positive values and high arousal, and associated with other emotional states, such as happiness, excitement, and ecstasy (Mauri et al., 2011; Weibel et al., 2011; Lin and Utz, 2015). Scholars (e.g., Harvey et al., 1998; Mauri et al., 2011; Barker, 2015; Guo et al., 2016) explain the cognitive and emotional attitudes found in flow theory as proposed by Csikszentmihalyi (1997). His theory refers to individual perceptions during activity participation. According to flow theory, participants "in the flow" exhibit three characteristics: engrossment, believing they can succeed, and immediate feedback. During flow states, participants performing an activity are fully absorbed and feel excitement and enjoyment (Weibel et al., 2011; Csikszentmihalyi et al., 2014; Reeve and Woollard, 2016). Also described as arousal, emotional ease through the interaction between positive emotions and high resonance, participants see high involvement as pleasurable playfulness (Mauri et al., 2011; Guo et al., 2016; Guazzaroni, 2020; Sylaiou et al., 2020).

The flow experience is often described as a steady fade into another state of mind, an extreme mental shift, and even a sense of "losing time," similar to a dissociative reality state and a loss of self-awareness. According to Csikszentmihalyi (1997), during flow, the emotions are contained and channeled based on the positive, energizing experience associated with the task. Participants who appear to exhibit a flow state note that defining characteristics include the intrinsic need to be engrossed in a fun way and remaining engaged throughout. Csikszentmihalyi et al. (2014) originally defined flow as an emotional experience; during full engagement, people feel that their activity status and emotion are inextricably bound. During a flow situation, museum activity participants are immersed in a feeling of engagement with the activity (Harvey et al., 1998; Morse et al., 2016).

Hypothesis Development

Museum audiences have new experiences with interactive 2-D or 3-D exhibits through manipulation of motion, sound, and light without the guidance of museum assistants (Reeve and Woollard, 2016; Taylor and Gibson, 2017; Ch'ng et al., 2019; Marín-Morales et al., 2019). Social media technologies seamlessly combine satiation of entertainment gratification and social interaction (Dohn, 2011). Platforms allow users to explore daily and immediate experiences by interacting with different social networks. Interactive strategies can also be created using technology via the multitude of available apps. Relevance relies on one's ability to assimilate new experiences through the process of interaction. Additionally, expressive individuals often share their knowledge and experience in response to commentary from other members of the community (Brida et al., 2012; Barker, 2015; Sundar et al., 2015; Morse et al., 2016; Pulh et al., 2019). Community members are able to experience relevant topics in the presence of others who seek similar gratification. Online relevance can serve as an alternative or supplement to face-to-face social interactions. Interaction with community members not only involves intrinsic connections, but receiving recognition from others due to legitimate participation promotes greater information sharing within subgroups (Sundar et al., 2015; Le et al., 2016; Siglioccolo et al., 2016; Roberts and Lyons, 2017). Taylor and Gibson (2017) argue that data and information are cold without meaning. Interaction must be cultivated so that knowledge sharing and creation can occur in virtual heritage communities. In many situations, relevance is described by participants as a feeling of being close to others, leading to continued interactions. These relevant relationships lead to increased and persistent emotional resonance (Shaw and Krug, 2013; Legget, 2018; Pulh et al., 2019). In the active dialog pertaining to one exhibition after the exhibition, participants engaged with the ideas of the curator to better understand cultural meanings. In doing so, they became more comfortable with museums and evaluated the museum exhibits as more

relevant for life well-being. Based on the foregoing discussion, we hypothesize the following:

H1: Users' perceived relevance of museum communities is positively related to the members' emotional resonance.

Ubiquitous access to other community members is a critical success factor provided within the online community for users who are seeking resonance relationships. Chi (2011); Camarero et al. (2018) argue that online community orientation includes socializing, altruism, and building relationships. Users look for more interaction with each other in online communities when they desire long-term relationships. Museums not only connect with the online community via multiple channels, but are also internally structured to facilitate unique interactive experiences that promote the emotional resonance of that community (Springer et al., 2015; Kabassi, 2017). In museum communities, participants through interaction show interest in using simple words and symbols with their connections to generate emotional resonance. Thus, the museum may spend little to maintain its relationships with loyal fans and create resonance for its members. According to Jafari et al. (2013), social interaction is an intrinsic motivating factor in maintaining membership in a community. Other members' friendships can also fulfill needs. By participating in this interactive sharing of personal opinion, members' altruism builds collaborative relationships and companionship (Pulh et al., 2019). Le et al. (2016) contend that managers should understand member complexities so that they can cultivate positive altruistic behavior. Therefore, giving online community members greater mutual support provides members with the incentive to continue future interactions. We, thus, construct the following:

H2: Users' perceived technology interaction with museum communities is positively related to members' emotional resonance.

A new trend in online museum communities is providing visitors complex or dynamic experiences that encourage them to create conversations involving multiple channels and motivations to find their source of resonance within the space (Ch'ng et al., 2019; Marín-Morales et al., 2019). Experiential activities and forum discussions that occur are often directly or indirectly related to managers' predesigned exhibition topics, comments, and interactions with other members of the community. Within a community, understanding common codes, graphics, marks, and styles are often seen as part of emotional resonance. Several studies (Brida et al., 2012; Jafari et al., 2013; Manna and Palumbo, 2018) investigate the benefits of esteem and collaborative community partnerships between museums and members of their communities. This process is always dynamic and evolves through established esteem practices and resonance that change over time. Participants may attempt to retain the emotional resonance of a community and their esteem and beliefs within this familiar environment to support and encourage the perpetual online community (Siglioccolo et al., 2016; Camarero et al., 2018). Technological tools and community climates that make individuals feel esteemed make it easier to construct emotional resonance within the community. We, therefore, hypothesize the following:

H3: Users' perceived esteem of museum communities is positively related to members' emotional resonance.

Camarero et al. (2018) assert that museums act as generators of creativity, that digital space agency matters, and that those interested in the exhibitions or digital displays can have a common experience with them. The concept of hybridity can be used to foster exhibitions that co-create with the new roles of the museum. The greater the number of participants visiting an exhibit, the more apt they are to communicate, jointly explore and answer questions about exhibits and enjoy the process. Museums can increase immersion and fun with respect to exhibits by combining online communities with social media. A larger number of community members allow for more tactile and tangible forms of interaction and fun with an exhibit (Weibel et al., 2011; Springer et al., 2015; Roberts and Lyons, 2017). The involvement process gives the members direct access to participate in the details of different facets of exhibit experiences. During the experience, participants demonstrate emotional resonance in connection, collaboration, and social interaction with others. Because the social exchanges are unique, they feel like active agents and not passive recipients, delivering added value. Omar et al. (2012) note that the convenience, usefulness, and enjoyment had from interacting with each other on Internet-based media led visitors to communicate more freely and obtain more resonance with the community.

During flow states, participants are often totally immersed in the connection, collaboration, and social interaction experience to the point of losing some sense of self-awareness (Csikszentmihalyi et al., 2014; Shin, 2018). In flow, emotions are positive, energized, and aligned with performing a task. Pierdicca et al. (2019) assert that flow is intrinsically tied to emotional engagement as well as the requirements for task experiences. Participants state that they devote time and effort to their activity because they gain a flow state of experience from it, in which their emotions are positive and energized with full involvement (Shaw and Krug, 2013; Huang et al., 2014; Guo et al., 2016; Chen and Fu, 2018). Flow mediates the connection to the presence and positive levels of emotion, and involvement experience leads to a higher level of resonance (Johnson et al., 2014; Marín-Morales et al., 2019). As discussed in flow theory findings (Weibel et al., 2011; Guo et al., 2016), playfulness activities and positive emotions produce flow, but immersive content or addictive behavior leads to more involvement behavior. Participants who exhibit a positive, playful attitude toward the involved experience are motivated to engage in contextual dialog around virtual exhibits and to continue to experience positive feelings. We, thus, construct Hypotheses 4 and 5:

H4: Users' perceived playfulness with respect to museum communities is positively related to members' emotional resonance.

H5: Users' perceived playfulness with respect to museum communities is positively related to their involvement in museum communities.

Museum diversity gives a community its unique strength, resilience, and richness by identifying members in the community and their interests and unique experiences (Csikszentmihalyi and Hermanson, 1995; Charitonos et al., 2012; Kabassi, 2017; Kim, 2018). In their collections and intellectual property, museums can create effective, unique exhibitions for the public: visitor-centered engagement that visitors can activate based on exhibition uniqueness. Access to online communities provides a unique experience that satisfies users' curiosity and enables gratification through technological interaction. Camarero et al. (2018) argue that perceiving a sense of a unique citizenship climate within the online community may produce resonance in individuals. Even though participants may perceive museums as presenting their own uniqueness, exhibits cross cultural backgrounds and integrate isolated individuals and communities. Based on real-world social networks and the concept of social capital, increased online involvement may not lead to a decline in real-world engagement. Jafari et al. (2013); Camarero et al. (2018) find that a dependable and like-minded community encourages the use of social media technology tools and community interaction in the physical world. Online communities inspire new ways of museum participation, build uniqueness and brand identity, and make museums more fun. Users receive interpersonal resonance by following micro-leaders and participating more in social relationships (Jafari et al., 2013).

Museum communities must satisfy the needs of all internal and external stakeholders, leading to constantly engaged involvement relationships, depending upon how much effort they devote to it, how much experience they have, and what thoughts are shared. Sylaiou et al. (2010) view involvement as the ways in which an individual's experience interacts with how they understand the world. However, Derrick et al. (2019) argue that users can satisfy the need for belonging to a community through these social relationships and the involvement of communities. Online museum communities are now collaborative and co-creative platforms without a formal contract: members make voluntary contributions and exhibit automated interactive involvement. Sylaiou et al. (2010); Camarero et al. (2019) observe that online communities represent an interactive component of the museum's mental and social space in which the museum's mission or resonance impacts user involvement. The dialog develops when viewers exchange observations, memories, and embodied responses while maintaining an internal dialog as they attempt to create emotional resonance with their interest in the exhibition (Shaw and Krug, 2013; Roberts and Lyons, 2017; Camarero et al., 2018; Legget, 2018). In order for emotional resonance to enhance user involvement, it must become part of an enduring state that involves interest in the exhibits as well as the issues they arouse. As members create resonance via interesting or knowledge-based dialog and receive support for or feedback on their efforts, community knowledge capital increases as do social connections and involvement with other community members. An individual's engagement behavior with museum audiences is an important topic that has been widely studied in terms of individual attention, emotional resonance, level of learning activities, and affective involvement (Russo et al., 2009; Roberts and Lyons, 2017). In a quantitative study, Roberts and Lyons (2017) use a sociocultural approach during an undergraduate field trip to an art museum to indicate factors that attracted student engagement, such as their prior knowledge, involvement, and hands-on activities. Museum online communities can be viewed as social aggregations in which people have a common resonance, discuss topics publicly, and share points of view about museum activities, leading to personal involvement that exists in cyberspace (Sundar et al., 2015; Pietroni et al., 2018; Sylaiou et al., 2020). We, therefore, hypothesize the following:

H6: Users' perceptions of the uniqueness of museum communities is positively related to members' emotional resonance.

H7: Users' perceptions of the uniqueness of museum communities is positively related to their involvement in museum communities.

H8: Users' perceptions of the emotional resonance of members is positively related to their involvement in museum communities.

A conceptualized structural model is presented in **Figure 1**.

METHODS AND DESCRIPTIVE STATISTICS

The current study constructs a theoretical model that can predict and explain museum community involvement behavior and then empirically tests the model. The validity and reliability of the items were tested to ensure the effectiveness of the research design. A self-administered, closed-ended questionnaire with ordered choices was used to understand undergraduate participation in Taiwan's museum communities.

Instrument Measure Development

Using traditional interview approaches and adapted measurement items in online communities, we attempt to understand the visitor experience in museum online communities through visitors' behavior and preferences. The flow theory literature provides a comprehensive foundational perspective on consciousness and perception and integrates the various components of online museum communities as we construct the research model. Our research model combines flow theory and information communication technology to uncover the psychological factors that influence individuals' involvement behavior. Three independent constructs were identified from flow theory and ICT interaction: playfulness, uniqueness, and technology interaction. A total of 17 questionnaire items for these three constructs were adapted from those in Mauri et al. (2011), Jafari et al. (2013), Shaw and Krug (2013), Csikszentmihalyi et al. (2014), Guo et al. (2016), King et al. (2016), Camarero et al. (2018), Kim (2018). Member perceptions of esteem and relevance in online communities, which include captivation and intangible experiences, relate to the social media tools used to enable the creation of immersion, flow, and physical pleasure pertaining to online community environment (Barker, 2015; Le et al., 2016; Legget, 2018). Given this, scholars contend that, only when

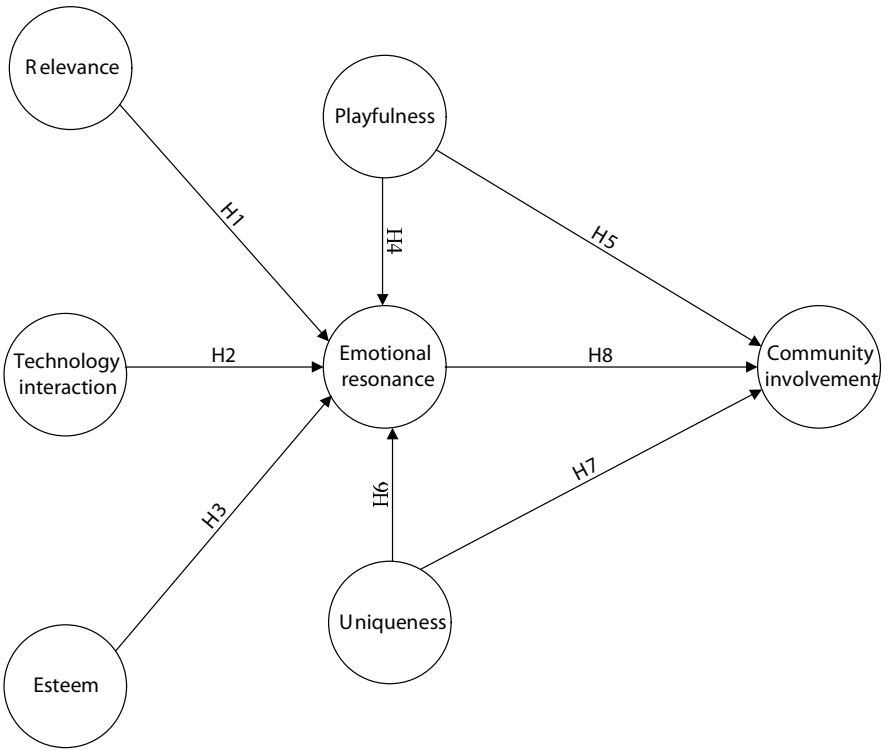

FIGURE 1 | The conceptualized structural research model.

individuals perceive esteem and relevance from a community will they habitually place the online community as a top priority. Because esteem and relevance within the community climate are intangible, the present study modifies items drawn from the survey approach of Barker (2015), which measures direct sensory perception, along with Siglioccolo et al. (2016), Legget (2018), constructing a total of six measurement items.

According to research, triggered situational interest is a temporary psychological state that describes the arousal of a person's attention for a short period of time by affect, novelty, or external information, in turn creating more enduring and persistent individual interest (Hidi and Renninger, 2006; Wigfield and Cambria, 2010; Knogler et al., 2015; Falk et al., 2018). Following the definition of Hidi and Renninger (2006); Knogler et al. (2015), interest is a protracted tendency to engage with a particular subject or activity over time. The interest questionnaire used in the current study was adapted from Knogler et al. (2015) and includes two dimensions: emotional attention or affect and continual involvement in related tasks. Therefore, in this study, audience emotional resonance was conceptualized as an affective construct that represents the positive emotion and enjoyment that audiences experience during their participation. The term "involvement" as viewed from a participant's perspective can be defined as easily interacting with community members, knowledge sharing and constructing, and switching between friendly online and off-line environments (Pietroni et al., 2018). To mitigate difficulties in measuring and observing continual participate behaviors, the present study used emotional resonance and involvement as indicators for continual behaviors, modifying question items from Sawyer et al. (2011); Charitonos et al. (2012), Knogler et al. (2015); Pietroni et al. (2018), Ch'ng et al. (2019) and on emotional resonance (four items) and community involvement (six items), and statements were modified to fit the context of the museum's online community.

To operationalize this study, we converted each of the constructs into statements that could be measured using Likert scales. All items were measured using a 5-point Likert-type scale ranging from "strongly agree" to "strongly disagree" (see **Appendix Table A1** for survey items). These statements were included in our questionnaire to evaluate users' subjective insights into experiences with museum websites and communities. Two stages were conducted in the pretest. Participants were allowed to complete the questionnaire on their own in 20 min, but could seek clarifications from the researchers at any time during the process in the first stage. After completing the questionnaires, researchers explained meaning of every question to participants and ensured no misinterpretation. The questionnaire was modified to ensure all statements were unambiguous and that participants would not feel overly burdened while completing it. This method allowed each participant to focus on latent insights while creating a compact instrument and avoided possible sources of misunderstanding. The initial questionnaires were administered to 100 students who reported that they had participated in a museum's online community. The pilot test Cronbach's α reliability scores ranged from 0.795 for relevance to 0.935 for playfulness, implying

that the scales used in this study satisfactorily measured the constructs of interest.

Sample and Descriptive Statistics

Data collection in this study consisted of two parts: a face-to-face quantitative questionnaire and online survey. Participation was completely voluntary. Participants had to be 18 or older and have experience interacting with museum communities via the Internet or mobile applications. On the survey, respondents identified their absolute usage of the museum online community or digital exhibitions, and then invitation e-mails were sent to potential participants to answer a series of questions on an attached URL linked to a web-based survey form. The face-to-face survey was conducted from April 1, 2018, to June 19, 2018, in six universities. Responses submitted by the end of the 60th day after the survey request were used in this study. A total of 1500 questionnaires were sent out. Participants who interacted less than twice within a 6-month period were excluded. After 2 months, a total of 1300 questionnaires were returned: 132 of these were considered problematic because of excessive missing data, "don't know," or N/A answers and response bias (e.g., responses were all 3 or 5 on the scale, outliers, and missing data). After filtering, 1168 valid responses (89.85%) were retained for analysis. The sample demographic data in **Table 1** depicts a diverse cross-section of the population: 30.8% were male, and 69.2% were female. Their average age was 21.5 years (standard deviation = 3.31). Participant information resources varied: social media was 50.2%, advertisements were 40.2%, public relations or news reports were 39.6%.

TABLE 1 | Respondent profiles.

Demographics	Level	Count	Percentage
Gender	Male	360	30.8
	Female	808	69.2
Age	Average	21.50	
	Maximum	57	
	Minimum	18	
	Missing value	7	
Information resources	Advertisement	491	42.0
	Public relation or news report	463	39.6
	Use keyword	188	16.1
	Promotion method	106	9.1
	Use the public media	157	13.4
	Official event	246	21.1
	Social media	607	52.0
	Community or nonprofit organization	141	12.1
	Websites	157	13.4
	Volunteer	30	2.6
	Other foundations	6	0.5
	Handbooks	21	1.8
	Special issue	42	3.6
	Direct marketing	11	0.9
	Cooperation manufacturer	31	2.7
	Sponsor	17	1.5
	Promotion of leaflet	129	11.0

RESULTS

Measurement Model Evaluation

We used SmartPLS3.0 (developed by Ringle et al., 2015) to analyze the data, evaluating convergent and discriminant validity and using a resampling bootstrapping process to obtain standard error rates and *t*-values. Based on the suggestions of Bagozzi and Yi (1988), we chose three of the most common indicators to assess the validity of the measurement model. First, we examined the measured variables' factor loadings on loading values. A rule of thumb is that factor loadings must exceed 0.7 within exploratory research contexts. Second, because using Cronbach's α to evaluate the reliability of constructs would underestimate their values, we opted for composite reliability (CR) (Bagozzi, 2011). All constructs were deemed reliable as they all possessed Cronbach's α figures that exceeded 0.803. Fornell and Larcker (1981) recommend that CR values should be greater than 0.6. In this study, CR values ranged from 0.884 to 0.925, exceeding the 0.7 threshold, thereby indicating favorable internal consistency (**Table 2**). Third, to test the discriminant validity, the value of average variance extracted (AVE) must exceed 0.5 (Fornell and Larcker, 1981). The AVE figures for latent variables in this study ranged from 0.630 to 0.729. The questionnaire items were also tested using the correlation matrix and for discriminate power to ensure their reliability and validity.

Following Fornell and Larcker (1981), we evaluated the discriminant validity of the research model to determine whether the square root of each construct's AVE was greater than the correlation between that construct and any other within the model. As shown in **Table 3**, the constructs' intercorrelation coefficients ranged from 0.535 to 0.802. Thus, the items overall demonstrated satisfactory convergent and discriminant validity.

Testing the Structural Model

"A structural model is analyzed to investigate and depict the link among variables in a proposed model" (Byrne, 1998). To estimate the significance of the path coefficients and test the hypotheses, a bootstrapping method using 5000 bootstrap subsamples was conducted in SmartPLS 3.0. The standardized path coefficients represent direct effects, path coefficients, *t*-values, and *p*-values as shown in **Table 4**. All the path coefficients were significant ($p < 0.05$) with *t*-values larger than 1.96. These paths reflect the

TABLE 2 | Reliability and validity indicators of the research model.

Construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Esteem	0.803	0.810	0.884	0.719
Technology interaction	0.855	0.867	0.895	0.630
Relevance	0.806	0.812	0.885	0.720
Uniqueness	0.873	0.874	0.908	0.664
Playfulness	0.905	0.911	0.925	0.640
Emotional resonance	0.875	0.882	0.915	0.729
Community involvement	0.898	0.899	0.922	0.663

TABLE 3 | The discriminant validity of research model.

	Emotional resonance	Uniqueness	Playfulness	Community involvement	Technology interaction	Relevance	Esteem
Emotional resonance	0.854						
Uniqueness	0.613	0.815					
Playfulness	0.597	0.616	0.800				
Community involvement	0.535	0.562	0.802	0.814			
Technology interaction	0.557	0.598	0.631	0.639	0.794		
Relevance	0.667	0.684	0.706	0.603	0.626	0.849	
Esteem	0.669	0.712	0.676	0.605	0.651	0.778	0.848

All correlations are significant at the 0.001 level; diagonal element is square root of AVE and should be larger than the off-diagonal correlation coefficient.

TABLE 4 | Paths coefficient and *t*-value.

Path	Beta	Mean	Std Dev	*t*-Value	*p*-Values
Relevance- -> Emotional resonance	0.239	0.239	0.043	5.614	0.000
Technology interaction- -> Emotional resonance	0.086	0.087	0.039	2.167	0.030
Esteem - -> Emotional resonance	0.234	0.234	0.049	4.812	0.000
Playfulness- -> Emotional resonance	0.118	0.119	0.040	2.931	0.003
Playfulness- -> Community involvement	0.716	0.716	0.024	29.959	0.000
Uniqueness- -> Emotional resonance	0.158	0.158	0.037	4.314	0.000
Uniqueness- -> Community involvement	0.088	0.087	0.029	3.060	0.002
Emotional resonance- -> Community involvement	0.054	0.055	0.027	2.037	0.042

impact of relevance (H1), technology interaction (H2), esteem (H3), playfulness (H4), and uniqueness (H6) on emotional resonance (0.239, 0.086, 0.234, 0.118, and 0.158) and playfulness (H5), uniqueness (H7), and emotional resonance (H8) on community involvement (0.716, 0.088, and 0.054, respectively). Path coefficients for each value from the models are shown in **Figure 2**. They confirm that the model explains a substantial portion of the variance in all the endogenous variables: 53.1% for emotional resonance and 65.2% for community involvement. The explanatory power of the endogenous latent variables approaches or exceeds the recommended value of 0.5, suggesting that the proposed research model was robust and stable.

Next, the direct effects of antecedents on the flow of emotional resonance (i.e., relevance, technology interaction, esteem, playfulness, and uniqueness) were examined. Online communities become relevant to participants because they offer a feeling that a given community matches participants' views of the world and allows them to pursue their interests and concerns (Shaw and Krug, 2013; Sundar et al., 2015; Siglioccolo et al., 2016). The use of online communities certainly increases the accessibility of information and speed of communication. It also increases resonance with the museum's exhibits and involvement in immersion activities. Jafari et al. (2013) establish an interactive sociality strategy for museums and note that social and interactive technology in online or off-line environments can allow members to feel esteem and establish relevance in the community. Respondents emphasized a process of communication that requires the continual exchange of thoughts and feelings, generating engaged discussion in the online community. Likewise, Brida et al. (2012), Le et al. (2016) find that esteem affects members' willingness to stay or leave and positively impacts the resonance of the community. In the online community, in addition to the members' understanding of the museum's purpose, for pursuit of knowledge growth and cultural literacy improvement, meaningful and pleasant memories of community activities are important in establishing relevance for the community. Following Camarero et al.'s (2018) basic principles, guiding emotional resonance is the notion that individuals will strategically select media to satisfy their entertainment and social-psychological needs. In short, members have external incentives (relevance, technology interaction, esteem) and belief incentives of exhibition content (playfulness, uniqueness) with the emotional resonance of the museum community as an intermediary to satisfy their exhibition visitation needs.

Several studies (Nah et al., 2011; Sawyer et al., 2011; Omar et al., 2012; Kim, 2018) employing the flow theory in online communities report playfulness to be positively correlated with emotional resonance and immersion involvement. The emotional resonance experience is grounded in a perceiver's own connection to past positive or negative emotions and community experiences. Such experiences are not necessarily the same for different people or at different communities. In a virtual museum, members can automatically make connections between exhibits and their own online inquiries, issues, and interests, enabling learning to become deeply motivating and meaningful (Springer et al., 2015). In many cases, online communities are given the opportunity to access revisited content (e.g., exhibition stories and streams) and increase their emotional resonance and immersion involvement, which can propel exhibitions into the limelight temporarily or quickly. In the online community, the higher the emotional resonance generated by the theme

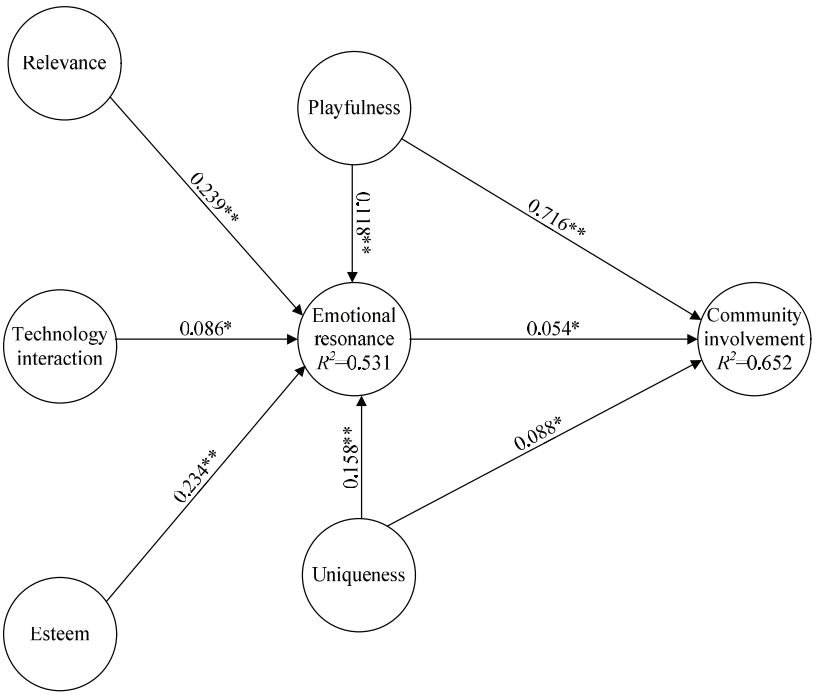

FIGURE 2 | Path coefficients for the research model. *: <0.05; **: <0.01.

exhibition of the museum, the more members will actively interact and share, and the greater the immersive involvement of the community (Siglioccolo et al., 2016; Pietroni et al., 2018; Sylaiou et al., 2020). Member develop their own unique meaning for exhibitions or objects, and these meanings and values can change together with interaction resonance or the values associated with audiences' immersion experiences.

DISCUSSION AND LIMITATIONS

Discussion

This study examines the relationship between institutions and online communities and clarifies the engaged forms of a diverse audience. Social media combined with forums serve as a central tool to connect users with physical museum exhibitions, where physical and online experiences are linked in captivating ways that create stories and extended knowledge for visitors (Sundar et al., 2015; Kim, 2018; Pietroni et al., 2018; Shin, 2018; Ch'ng et al., 2019). In this sense, the importance of interactive playfulness should be emphasized because playfulness is positively associated with emotional resonance and involvement. Online museum communities should act as a catalyst for promoting new learning based on the interests and previous knowledge of individuals. As platforms of knowledge and cultural representation, online communities can act as catalysts for museum change by building bridges between professional interest groups and across society (Brida et al., 2012; Charitonos et al., 2012; Sundar et al., 2015; Morse et al., 2016; Kim, 2018), embedding community opinions in the meaning and sense of exhibitions, cultivating awareness of social roles, and increasing interest in the museum through entertaining components that engage those with whom they co-create. Based on the results of this study, online museum community managers should encourage participants to form their own online teams based on existing resonances to maximize the potential for emotional arousal and its benefits for engagement. This concept echoes the conclusions of Charitonos et al. (2012); King et al. (2016), Dudley (2017); Camarero et al. (2018), Pierdicca et al. (2019). Online exhibitions generate a distinctive, vibrant museum resonance experience whose purpose is to enhance the users' online involvement through its attributes of interactiveness and playfulness. Through social media platforms, museums can respond to user opinions and suggestions by re-contextualizing their collections. This can promote citizens' interest in cultural artifacts as well as museum online community involvement.

Meanwhile, we identify relevance and esteem as means to increase individual emotional resonance, consistent with previous studies (Sundar et al., 2015; Roberts and Lyons, 2017; Taylor and Gibson, 2017; Kim, 2018; Derrick et al., 2019). This allows the manager to respect how participants care about what topics and how they can make meaningful choices based on interactive experiences. Community members provide dialog and knowledge resonance as inputs to the process through which the visitors and the museum service providers become coproducers of experiences. Our findings are conducive to the social interaction construction core of emotional resonance. Audiences expect an immersive experience when they visit a museum, but this experience gap is eliminated when social media is integrated with online and off-line experiences that are

intended to promote connections between visitors concerning themes that are personally relevant and interesting to them. Social media can help overcome limitations associated with exhibition interpretations by providing current interactive content without the need for renovating a physical dialog channel. Museum staff must understand how instructional technology interaction design and development are specifically applied to users' online experience in a museum community context, which can satisfy individual needs for relevance and esteem.

Many museums have recently undergone enormous changes in their digital exhibition and social interaction programs, which highlights the potential of enhanced playfulness and uniqueness (Russo et al., 2009; Dohn, 2011; Sawyer et al., 2011; Shaw and Krug, 2013; Sundar et al., 2015; Roberts and Lyons, 2017). Playful activities that produce flow are not only pleasurable, but also easily become addictive as they have the potential to enhance unique meaning and life. The depth of esthetic feeling, curiosity, and meaning-sense activities are related to cognitive and playfulness motives and can provide the museum's audience with additional information to generate emotional resonance or increase involvement. This is consistent with the conclusions of Harvey et al. (1998); Csikszentmihalyi et al. (2014), Springer et al. (2015); Guazzaroni (2020). To engage participants, online museum communities have used augmented reality, virtual reality, and mixed reality technologies to extend museum concepts beyond physical limits, create sensory experiences, and reduce institutional barriers. When a museum manager clearly directs a discussion to exhibit themes, members who encounter these themes are more likely to achieve leisure and entertainment and receive feedback. The expanding digital mission of museums reflects their internal awareness and also serves as a way to attract online community visitors (Sawyer et al., 2011; Lammes, 2017; Falk et al., 2018; Pierdicca et al., 2019).

Finally, online communities have synthesized cognitive, sociological, and esthetic approaches to understanding museum collections in an effort to increase interactive involvement. Engaging in esthetic activities can catalyze personal growth and transformation. While appreciating exhibits, consistent with the literature, discussion of multiple meanings and exchanging thematic ideas is important as there are multiple co-creative interpretations and knowledge that can be constructed (Harvey et al., 1998; Jafari et al., 2013; Allen and Crowley, 2014; Kim, 2018; Derrick et al., 2019). Participants in this study mentioned they better appreciated exhibits due to the additional interaction and involvement available through social communication technology. The active museum's online communities played a facilitator role in those visitors' online experiences, which brought about a greater focus and engagement (Chi, 2011; Sawyer et al., 2011; Barker, 2015; Taylor and Gibson, 2017; Derrick et al., 2019; Pierdicca et al., 2019). Museum online community and discussion forums allow participants to express different perspectives about the same exhibition and listen to each other. In addition to feelings of esteem and relevance associated with their engagement with the exhibition content, a significant number of participants agreed that they had experienced an emotional resonance and said that they felt more committed to involvement in the online community going forward.

Limitations

Virtual museums allow members to choose the depth of their engagement with exhibits through nuanced digital presentations that appeal to diverse audiences. This study used a limited test sample to measure personal presence in relation to a specific online interactive experience. With the self-reported questionnaire, there is risk of a response bias for participants from different sources. Before the data from the online and off-line sources of respondents were combined into PLS analysis, we suggest that chi-square or parameter statistical analysis be used to investigate the differences between the data collected from off-line and online sources. However, we did not further analyze or explore the relationship between digital exhibition types and involvement behavior. These results may be specific to a given online community, which may limit generalization of the research findings to other populations. Additional investigations with other types of exhibitions are necessary to generate findings that are more robust and generalizable. We did not specifically separate the participants into high and low emotional resonance groups to test model differences. Future researchers should consider this. Future studies can explore the characteristics of flow theory and online community camaraderie principles to learn more about participant interactions with other participants as well as with the online community system.

CONCLUSION

In 2019, the Taiwan government's Ministry of Culture proposed a draft "Cultural Science and Technology Act" to encourage museums to use technology for digital applications and promote cultural participation and friendly access use to help shape the cultural civil society of the digital age. Growth in culture tourism has prompted the construction of new museums and the adjustment of existing exhibits to include more complex knowledge and new media. Major museum-related exhibitions and events are dedicated to communication and interaction within online communities. Online museum communities are unique and important: Internet-based communication allows for the discussion of enhanced experiences and objectives as compared to traditional museums. Our results indicate that perceived uniqueness marginally increases emotional resonance but also slightly improves user involvement. Audience perceived playfulness is a powerful way to increase user involvement, and emotional resonance has a weak but significant effect on user involvement. Interactivity between members and exhibit resonance motivate audiences to become involved in online communities. Such communities are important for museums. Perceived relevance and esteem marginally increase emotional resonance, which enhances user involvement. These findings provide important insights for researchers and professionals into the significant role played by museum managers as they engage audiences through providing interactive experiences in online environments.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

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

AUTHOR CONTRIBUTIONS

T-LC contributed to concept and design, interpretation of data, and writing up. W-CL contributed to data collection, interpretation of data, writing up, and study supervision. T-KY contributed to concept and design, data collection, statistical analysis, interpretation of data, and writing up. All authors wrote the manuscript together and approved the final manuscript.

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

APPENDIX A

TABLE A1 | Questionnaire survey items.

Construct	Measurement item	Mean	S.D.
Esteem	This website is very popular among visitors.	3.798	1.189
	I will proudly say that I have joined this museum's community.	3.628	1.182
	The popularity and recognition of the community are higher than that of other museums.	3.680	1.159
Technology interaction	This website uses the activity viewing board and audience interaction to guide visits.	3.622	1.099
	This website uses a wireless guidance system (APP or QR code) to guide visitors.	3.440	1.118
	This museum uses an automated touchscreen audiovisual navigation system to guide visitors.	3.371	1.111
	This community provides space for social interactions.	3.665	1.106
	This community provides related written information for visitors to read.	3.607	1.099
Relevance	This community provides more meaning to the artistic lives of visitors.	3.762	1.142
	This community can fill visitors with happy memories.	3.774	1.187
	This community easily reminds visitors of its products and services.	3.528	1.069
Uniqueness	The appearance of this community is very different from other museums.	3.627	1.204
	The local features of the community present very differently from that of other museums.	3.646	1.123
	Promotion of the community is presented very differently from that of other museums.	3.528	1.073
	Attributes of online exhibition of the community are very different from that of other museums.	3.572	1.048
	Attributes of online activities of this community are very different from that of other museums.	3.537	1.033
Playfulness	I feel this community provides visitors with a fun experience.	3.509	1.066
	I feel this community is very esthetically pleasing.	3.456	1.021
	I feel that this community allows me to control the combination of layout and content.	3.248	1.028
	I feel this community can stimulate visitors' curiosity.	3.520	1.036
	I feel this community meets the needs of the visitors.	3.532	1.030
	I feel the community provides meaningful interactions with visitors.	3.520	1.040
	I feel the community highlights interesting information on visitors' participation in activities.	3.505	1.040
Emotional resonance	I am interested in knowing more about this museum's activities through the community.	3.574	1.099
	When I see discussions about the museum's community on social media, I am interested.	3.517	1.120
	Compared to other people, I am more interested in this community's news.	3.316	1.071
	If this museum's community shuts down, I will miss it.	3.593	1.228
Community involvement	The museum's community allows visitors or volunteers to form a community.	3.432	1.032
	The museum community provides the fruits of participants' communication.	3.397	1.010
	The museum community encourages close interaction among participants.	3.431	1.004
	The museum community's interactions revolve around an interesting theme.	3.493	1.055
	Autolinks can be generated on the community when members share on Facebook, Instagram, or LINE.	3.435	1.047
	The museum's community uses themed activities to support online or offline relationship maintenance.	3.418	0.967

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Students' Acceptance of Technology-Mediated Teaching – How It Was Influenced During the COVID-19 Pandemic in 2020: A Study From Germany

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In response to the impending spread of COVID-19, universities worldwide abruptly stopped face-to-face teaching and switched to technology-mediated teaching. As a result, the use of technology in the learning processes of students of different disciplines became essential and the only way to teach, communicate and collaborate for months. In this crisis context, we conducted a longitudinal study in four German universities, in which we collected a total of 875 responses from students of information systems and music and arts at four points in time during the spring–summer 2020 semester. Our study focused on (1) the students' acceptance of technology-mediated learning, (2) any change in this acceptance during the semester and (3) the differences in acceptance between the two disciplines. We applied the Technology Acceptance Model and were able to validate it for the extreme situation of the COVID-19 pandemic. We extended the model with three new variables (time flexibility, learning flexibility and social isolation) that influenced the construct of perceived usefulness. Furthermore, we detected differences between the disciplines and over time. In this paper, we present and discuss our study's results and derive short- and long-term implications for science and practice.

Keywords: COVID-19, digital learning, discipline differences, e-learning, TAM, technology acceptance, technology-mediated teaching, university teaching

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INTRODUCTION

Digital technologies have provided support in diverse policy, business, and societal application areas in the COVID-19 outbreak, such as pandemic management (Radanliev et al., 2020b), corporate communications (Camilleri, 2020), analysis of research data (Radanliev et al., 2020a), and education (Crawford et al., 2020). COVID-19 started as a global infectious disease in the spring of 2020, but the necessary measures to control the virus went beyond treatment and were also directed against its spread. Thus, for months, all interpersonal relationships were characterized by social distancing, and the pandemic raised not only medical but also social, economic and technological issues, among others. Higher education was one domain that the pandemic affected

radically (Nuere and de Miguel, 2020; Watermeyer et al., 2020). During the worldwide lockdown, higher educational institutions had to immediately switch their activities from the classroom and the campus to a virtual space, which was the only alternative to a complete incapacity to act (Crawford et al., 2020; Kamarianos et al., 2020; Karalis and Raikou, 2020; Owusu-Fordjour et al., 2020; Shah et al., 2020).

University students represent a generation of digital natives for whom this steady switch from the real to the virtual world should not pose any operational challenge (Carlson, 2005; Berk, 2009; Jones et al., 2010). However, research indicates that students show differences according to discipline, such as subject matter (Biglan, 1973; Neumann, 2001) or facets of digital literacy and competency (Nelson et al., 2011), which should be taken into consideration when developing digital learning environments and approaches. The issue of whether and how teaching and learning differs across disciplines has however long been neglected in academic discourse (Neumann, 2001). Furthermore, as in any field, the successful introduction of technology into existing processes – such as the phenomenon that occurred in the COVID-19 pandemic during the spring–summer 2020 semester (or the so-called COVID-19 semester) – can only be guaranteed if teachers and students show or develop appropriate attitudes, beliefs, behaviors and habits (Al-alak and Alnawas, 2011; Al-Harbi, 2011).

Starting from the circumstances of the pandemic – a rapid transition to fully technology-mediated teaching for students taking different subjects, with no alternative, accompanied by several months of social isolation – in this paper, we ask:

Do the acceptance toward completely technology-mediated teaching differ, depending on the discipline of study?

Did the students' acceptance toward completely technology-mediated teaching change over time during the COVID-19 semester?

To address the research questions, we empirically examine the acceptance of technology-mediated teaching by students during the COVID-19 semester in the spring-summer of 2020. We follow the suggestion of Neumann (2001) that "the strong influence of disciplines on [. . .] students' learning" creates the need "disciplines to be subjected to greater systematic study, especially regarding their effect on the quality of teaching and learning in higher education," and present, analyze and discuss the collected data from 875 responses gathered from students of two disciplines (information systems [IS] and music and arts [M&A]) at four points in time.

For our empirical investigation, we apply an extended version of the Technology Acceptance Model (TAM). Technology acceptance is a main topic in information systems (IS) research, and TAM is a widely used approach to investigating a subject's attitude and adoption behavior, *inter alia* in university context (Venkatesh and Davis, 2000; Lee et al., 2005; Pituch and Lee, 2006; Al-Azawei et al., 2017). For the purpose of this study, the model allows us to investigate the acceptance of technology-mediated teaching, especially regarding certain aspects (usefulness, ease of use and enjoyment) that are relevant for students. Our goal is to understand not only whether students accept technology-mediated teaching but also what key aspects are decisive for the future design of technology-mediated teaching environments. For this reason, we apply the TAM, as well as look beyond the model at the research on the advantages and the disadvantages of technology-mediated teaching and the extended TAM, using three new variables to be able to analyze the construct of perceived usefulness for students during the COVID-19 season in more detail and depth.

This paper is organized as follows: In Section "Theoretical Framework," we discuss the theoretical foundations of our investigation. The design and the procedure of the study, as well as the measures and data analysis are presented in Section "Materials and Methods." The presentation of the results is the focus of Section "Results." We discuss the results of the analysis in Section "Discussion of the Results" and provide implications for teaching practice and organization, educational technology, and research in Section "Implications for Teaching Practice, Educational Technology and Further Research." We conclude this paper in Section "Conclusion" with a short summary, limitations of the study, and remarks on future studies.

THEORETICAL FRAMEWORK

Technology Acceptance Model (TAM)

The TAM is one of the most widely investigated and applied models of technology acceptance. Perceived usefulness (PU) and perceived ease of use (PEOU) are the two decisive variables for a person's attitude (ATT) toward a used technology, which in turn affects the actual system use. PU depicts a person's subjective sensation that the application of a certain technology improves individual work performance, while PEOU measures a person's perception of how much effort the usage of the new technology requires. Both variables are influenced by diverse external variables, such as job relevance, subjective norm or output quality (Venkatesh and Davis, 2000). Davis et al. (1989) adjusted the model by adding a person's behavioral intention (BI) as mediator between ATT and actual system use.

Table 1 shows an overview of the research on the TAM in the e-learning context. For the e-learning context, Lee et al. (2005) added perceived enjoyment (PE) as an intrinsic motivator, in addition to PU and PEOU, to TAM constructs. Šumak et al. (2011) conducted a meta-analysis and found that the TAM was the most applied model in e-learning and that the size of the causal effects between individual TAM-related factors depends on *the type of user* and *the type of e-learning technology*.

For our study, we adapt the research model of Lee et al. (2005), as presented in **Figure 1**.

Consistent with the findings of prior studies (cf. Davis et al., 1989; Lee et al., 2005), we expect the relations among the constructs to exhibit significant strength (for the list of the hypotheses, cf. **Attachment 1**). However, in our discussion, we take into account that the TAM in e-learning is usually researched in cases where blended learning or e-learning is an additional part of face-to-face teaching, whereas in the COVID-19 semester, virtual teaching and learning was

TABLE 1 | Previous research related to TAM in e-learning.

Study	Constructs	Method	Key findings
Šumak et al., 2011	perceived usefulness, perceived ease of use, attitude toward using, behavioral intention, usage, self-efficacy, satisfaction, social influence, compatibility, facilitating conditions, performance expectancy, confirmation, experience, system quality, anxiety, computer self-efficacy, management support, and flow	Meta-analysis	TAM is the most applied model in e-learning. The size of the causal effects between individual TAM-related factors depends on the type of user and the type of e-learning technology. PEOU and PU influence the user attitudes toward using an e-learning technology in equal measure for different user types and types of e-learning technology settings
Selim, 2003	perceived usefulness, perceived ease, course website ease of use, course website usefulness, course website usage	SEM of LISREL	usefulness and ease of use are good determinants of the acceptance course websites are an effective and efficient learning technology
Lee et al., 2005	perceived usefulness, perceived ease of use, perceived enjoyment, attitude, behavioral intention	SEM of LISREL VIII	perceived usefulness and perceived enjoyment had an impact on both students' attitude toward and intention to use ILM. Perceived ease of use was found to be unrelated to attitude.
Liu et al., 2005	e-learning presentation types, perceived usefulness, perceived ease of use, attitude, intention	repeated-measures one-way ANOVA test with the independent variable	Dual identity of the online e-learning user as a system user and a learner was confirmed. Both the flow and the perceived usefulness of the e-learning system strongly predict intention to continue using e-learning
Pituch and Lee, 2006	system characteristics, learner characteristics, perceived usefulness, perceived ease of use, use of an e-learning system	SEM	E-learning presentation type and users' intention to use e-learning were related to one another. Concentration and perceived usefulness were considered intermediate variables
Park, 2009	e-learning self-efficacy, subjective norm, system accessibility, perceived usefulness, perceived ease of use, attitude, and behavioral intention to use e-learning	SEM	TAM to be a good theoretical tool to understand users' acceptance of e-learning. E-learning self-efficacy was the most important construct, followed by subjective norm in explicating the causal process in the model
Tarhini et al., 2013	social norms, quality of work life, perceived usefulness, perceived ease of use, attitude, behavioral intention, usage	SEM	Analysis results reveal that all the hypotheses are supported
Mohammadi, 2015	quality features, perceived ease of use, perceived usefulness on users' intentions, satisfaction, usability toward use of e-learning	SEM, path analysis	'Intention" and "user satisfaction" both had positive effects on actual use of e-learning. "System quality" and "information quality" were found to be the primary factors driving users' intentions and satisfaction toward use of e-learning. "Perceived usefulness" mediated the relationship between ease of use and users' intentions
Al-Azawei et al., 2017	e-learning self-efficacy, perceived satisfaction, learning styles, perceived usefulness, perceived ease of use, intention to use	PLS SEM	Highlights the integration of perceived satisfaction and technology acceptance in accordance with psychological traits and learner beliefs. Model achieved an acceptable fit and successfully integrated intention to use (ITU) and perceived satisfaction

the only channel used to convey content. We examine the measurement model and the structural model and then compare the results over time and for the two student populations (IS and M&A).

Acceptance Over Time

Venkatesh and Davis (2000) tested an extended TAM (TAM2) in four longitudinal studies and introduced experience as a relevant influencing factor that is important for understanding the changes in PU over time, whereby experience in general reflects an opportunity to use a technology and is typically operationalized as the passage of time from an individual's initial use of a technology. Based on the TAM, Venkatesh et al. (2003) developed UTAUT and tested it in a longitudinal field study. Venkatesh et al. (2012) introduced three new constructs to UTAUT, measured users' experience and investigated its influence on the users' acceptance and habits.

Davis and Wong (2007) applied TAM2 in an educational context and measured users' experience in relation to the actual student usage (system use) of an e-learning system. They pointed out the complex underlying interactions during e-learning adoption processes and recommended a longitudinal design as appropriate for future studies. Pynoo et al. (2011) applied UTAUT in the educational context to investigate the acceptance of digital learning environments and found differences over time; they also pointed out that the usefulness of digital learning environments should be demonstrated to maximize its use.

In contrast to other studies, our study does not focus on a specific technology but on the experience with the technology-mediated teaching in the COVID-19 context. We expect and show within this context that students gain experience during the semester, which will lead to measurable changes in their acceptance.

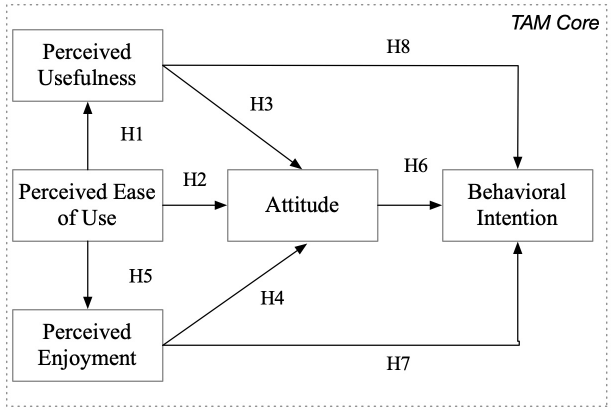

FIGURE 1 | Research model (adapted from Lee et al., 2005).

Differences in Acceptance Between Student Groups

Hu et al. (1999) define a set of users' characteristics as one factor that can be used to explain, predict and effectively manage technology acceptance.

Biglan (1973) points out the characteristics of academic matter, according to which the strongest differences between the "hard" (e.g., engineering sciences) and the "soft" sciences (e.g., social sciences, educational sciences, and humanities) can be identified. Vo et al. (2020) investigated the effects of blended learning on student learning performance and compared the output of students in hard and soft disciplines. According to their study, students in soft disciplines perform better than their peers in hard disciplines when courses are designed in the blended learning modality. Cameron (2017) identified differences in student engagement between 'humanities' (e.g., M&A) and 'professional fields' students (such as IS). Additionally, teaching experiences are more highly regarded by humanities students than those in hard sciences (Cashin and Downey, 1995). In the context of our study, this is expected to lead to differentiating results when lecturers had to quickly change toward virtual formats based on their diverse levels of experience with technologies. Pike et al. (2012) found that that students' academic majors are significantly related to levels of engagement, which is influenced by their acceptance and learning outcomes. Students of enterprising disciplines are more engaged than artistic discipline students. Students of soft applied knowledge (e.g., M&A) need more intensive practical training than those from the disciplines of hard applied knowledge (e.g., IS) (Neumann et al., 2002). Here might be a major disadvantage for specific groups when virtual teaching is applied for learning.

According to the research on the learning characteristics and the learning styles of the Net generation (born after 1980) and the Z generation (millennials), university students at the time of the COVID-19 crisis are digital natives, who can be described as tending toward independence and autonomy in their learning styles, technology savvy, interested in communicating visually and in multimedia and able to move seamlessly between real and virtual worlds (Carlson, 2005; Berk, 2009; Jones et al., 2010). Despite this, it is also characteristic of this generation to view class as a social opportunity and to crave face-to face social interaction, whereby relationships, in-person conversation, interaction and collaboration are high priorities (Howe, 2000; Carlson, 2005; Ramaley and Zia, 2005). Zheng et al. (2017) investigated low- and high-performing students in an e-learning environment and identified a significant difference in the students' perceived usefulness. Xu and Jaggars (2014) found that the typical student had more difficulty with succeeding in online courses than in face-to-face courses [compare also (Nelson et al., 2011); they also noted a variation across subject areas in terms of online course effectiveness].

To the best of our knowledge, to date, no research has put the TAM in the context of the specific characteristics of a study's subjects. This is where our study can make a contribution, as we have examined two different subject groups: M&A students and IS students.

In summary, we expect differences in the students' attitudes toward virtual learning, according to their academic subject.

Benefits and Disadvantages of E-Learning

The benefits and the disadvantages of technology-mediated teaching and learning became a focal point for university research in the context of the COVID-19 crisis (Kamarianos et al., 2020; Karalis and Raikou, 2020; Owusu-Fordjour et al., 2020; Shah et al., 2020). However, this topic is not new but one of the central research focuses in the context of learning in digital learning environments. Davis and Wong (2007) define e-learning as a global phenomenon for organizations and educational institutions, aiming to enhance students' learning experience and effectiveness in terms of the learning outcome. The benefits of e-learning have been discussed in recent research, but so far, there is no consensus on whether the outputs of e-learning are more effective than those of traditional learning formats (Derouin et al., 2005). The most frequently stated benefits are cost efficiency, flexibility (in terms of time and place), saving time to travel to the learning location, easy access to learning materials, as well as the usefulness of learning materials for a longer period (Welsh et al., 2003; Brown et al., 2006; Hameed et al., 2008; Jefferson and Arnold, 2009; Hill and Wouters, 2010; Al-Qahtani and Higgins, 2013; Becker et al., 2013), or the potential to offer personalized learning according to the learner's specific needs (Berge and Giles, 2006).

On the negative side, technology-mediated learning lacks direct social interaction and a personal touch and has the potential to socially isolate the learner or at least to negatively influence social aspects of learning processes (Gimson and Bell, 2007; Hameed et al., 2008; Al-Qahtani and Higgins, 2013; Becker et al., 2013). Socially isolated learning can negatively influence the development of learners' communication skills, as well as change communication conditions, including the lack of support and feedback using non-verbal cues or by observing the interactions of others, as well as the lack of social and cognitive presence and teacher's involvement (Al-Qahtani and Higgins, 2013). Furthermore, learners are insecure about

their learning in the absence of regular contact to the teachers (Al-Qahtani and Higgins, 2013). Technology-mediated teaching and learning requires self-motivation, time management and a focused approach and self-directed learning and organization skills of learners (Hameed et al., 2008; Jefferson and Arnold, 2009). According to Al-Qahtani and Higgins (2013), these requirements arise partly from the conditions of social isolation and lack of direct social interaction, which means that the learner must have a relatively strong motivation to mitigate this effect.

During the lockdown of the universities the expectation was that most of the young students will not have any difficulty in switching to online teaching, which is indeed confirmed by actual findings (e.g., Kamarianos et al., 2020). Shah et al. (2020) point out the numerous and immediately apparent benefits of transferring learning to the virtual world: free exchange of information, access to lectures and presentations at conferences that used to involve considerable travel costs, webinars and online discussions, reduction of time inefficiency associated with travel and increased commitment. Owusu-Fordjour et al. (2020) identify negative effects, e.g., learning at home can be ineffective because of many distractions, no adequate learning environment, or contact with the teacher. Less problems have been found in switching to online teaching, however, on the negative side, technical obstacles as well as lack of communication and cooperation, difficulties to concentrate, too many screen-time, lack of logistical infrastructure, non-physical presence, more workload and the loss of lab courses and the general restriction of social contact have been pointed out as important during the crisis. To the positive characteristics belong the easy participation in class, time savings, home comfort, the possibility to learn, new competences, attending and learning flexibility.

MATERIALS AND METHODS

Study Design

We conducted a longitudinal study in four German universities using an online survey to capture students' perceptions of technology-mediated teaching throughout the COVID-19 semesters in 2020. Participants in the study were students from selected courses and programs that have been invited to voluntarily take part in the survey. To identify potential *differences between disciplines*, we gathered responses from different subjects being taught. We have used from the beginning defined e-mail distribution lists and the group of potential respondents remained the same throughout the study. Students were asked for their agreement to the respective statements on an administered LimeSurvey. One survey was administered at the beginning of the semester in Germany (April), two surveys during the semester (May and June), and a final survey at the end of the semester (July 2020).

Measures

The study focused on two main theoretical constructs: (1) (technology) acceptance of e-learning (see Section "Technology Acceptance Model") and (2) the benefits and disadvantages of e-learning compared with face-to-face or blended learning (see Section "Benefits and Disadvantages of E-Learning"). We relied on pre-tested scales when possible; however, we had to adopt these scales for our study. Furthermore, we collected demographic data and asked open-ended questions to gain deeper insights into students' perceptions over the semester.

Concerning the first group of acceptance measurements, we used related items from former studies in a comparable context. We adopted the measurement scales for PU, PEOU, PE, ATT, and BI from Lee et al. (2005), as the authors had already pre-tested these constructs for e-learning activities and proven their applicability. As in the original constructs, the items were measured using a 7-point Likert scale. Slight modifications were made to fit items to the investigated e-learning context.

To address the benefits and disadvantages of e-learning, the identified factors (see Section "Benefits and Disadvantages of E-Learning") were operationalized through a combination of previous studies and the authors' assessment. As highlighted in the previous chapter, for time flexibility (TF), learning flexibility (LF), and social isolation (SI), the theoretical literature provides several important insights into the factors behind the advantages and disadvantages of technology-mediated teaching environments. **Table 2** provides an overview of survey constructs and related measurement items as well as their sources of adoption.

Procedure

To identify differences in students' perceptions over time, we surveyed the same student populations four times during the semester. At University 1, we gathered responses from master's students in IS, while at Universities 2, 3, and 4, we surveyed participants involved in courses that are part of the music and arts curriculum (bachelor, M&A).

We sent a link to the questionnaire throughout the semester and gathered 875 responses, of which 246 (28%) came from IS students and 629 (72%) from M&A students. We gathered 147 responses in April, 319 in May, 269 in June, and 128 in July. Of the responses, 59% (513) were received from women, 35% (310) came from men, and the remaining 62 (6%) specified another sex or provided no information.

TABLE 2 | Measurement scale.

Concept/ Context	Construct	Measurement scale source
Technology Acceptance	Perceived Usefulness	Adopted from Lee et al. (2005)
	Perceived Ease of Use	Adopted from Lee et al. (2005)
	Perceived Enjoyment	Adopted from Lee et al. (2005)
	Attitude	Developed based on Lee et al. (2005)
	Behavioral Intention	Adopted from Lee et al. (2005)
Benefits and disadvantages e-learning	Learning Flexibility	Modified and further developed from Jefferson and Arnold (2009)
	Time Flexibility	Developed based on Al-Qahtani and Higgins (2013)
	Social Isolation	Modified from Becker et al. (2013)

Data Analysis

Data preparation and analysis were conducted in R with the Stats package, version 3.6.1. Incorrect encodings and values were filtered manually. Throughout the survey, no questions were designated as mandatory. For model testing, only constructs for which all related items were answered were used. Regression model analysis was used to test the individual models. Regression models were estimated using the ordinary least square (OLS) method. The survey constructs were calculated based on the mean values of the respective items. Given the focus of our study, we employed the students' subject as the control variable in all model constructs (see the section on the differences between student groups). A binary dummy variable indicating the M&A group was used.

Table 3 provides descriptive details for the model constructs. The constructs average values varied. The respondents assessed the ease of using technology-mediated teaching and related technologies as relatively high (avg. 5.2, SD = 1.19) and simultaneously stated that learning with digital technologies did not necessary lead to completely socially isolated work (avg. 3.47, SD = 1.57). The students were almost in agreement regarding the benefits of learning flexibility (avg. 4.92) and time flexibility (avg. 5.01).

A comparison of the students' groups revealed that uniformity within the information systems group was larger in almost any of the respective constructs (standard deviation was lower). Moreover, we observed that the agreement was higher for the central model constructs for the group of IS students. Details are discussed in the following sections.

Measurement Validity

To ensure the validity of the measurement constructs, two approaches were used. For the new items regarding the benefits and disadvantages of technology-mediated teaching and learning, we first employed an explorative factor analysis (EFA) to assess their suitability to measure related aspects. Apart from the developed items, we assessed the internal validity for all constructs in the model.

Explorative factor analysis has been applied for the constructs related to technology-mediated teaching and learning validity and reliability. A principal component factor analysis with a maximal likelihood estimation rotation was performed on the collected items. The related nine items were employed in a factor analysis, resulting in three constructs. Factor 1 (time flexibility) comprised two items reported on a 7-point Likert scale that explained 30% of the variance with factor loadings from 0.652 to 0.997. Factor 2 (learning flexibility) comprised two items (instead of the three expected, compare **Table 4** for the item deleted after the EFA) reported on a 7-point Likert scale that explained 12% of the variance with factor loadings from 0.573 to 0.678. Factor 3 (social isolation) comprised three items reported on a 7-point Likert scale that explained 26% of the variance, with factor loadings from 0.758 to 0.929. Following the results of the EFA, the factors social isolation and time flexibility matched our developed items for each construct. Concerning learning flexibility, the item related to the video lectures (c.f. **Table 4**) did not match to a significant extent (0.351) and was dropped accordingly.

Lastly, the internal validity was assessed for all constructs. The established group of technology acceptance constructs was only tested for their internal validity through Cronbach's alphas. **Table 4** provides an overview of the survey constructs internal validity and the survey items used. Apart from the PU and

TABLE 3 | Descriptive information on model constructs.

Construct	Min	Max	Mean	SD	Mean (SD) – Group IS	Mean (SD) – Group M&A
Perceived usefulness	1	6.67	3.97	1.02	4.64 (0.69)	3.71 (1.01)
Perceived ease of use	1	7	5.2	1.19	5.50 (1.08)	5.09 (1.21)
Behavioral intention	1	7	4.33	1.68	5.35 (1.21)	3.93 (1.68)
Perceived enjoyment	1	7	4.14	1.81	5.35 (1.23)	3.66 (1.78)
Attitude	1	7	4.24	1.56	5.50 (1.04)	3.75 (1.45)
Learning flexibility	1	7	4.92	1.26	5.72 (0.92)	4.60 (1.23)
Time flexibility	1	7	5.01	1.43	5.76 (1.10)	4.72 (1.44)
Social isolation	1	7	3.47	1.57	3.63 (1.11)	3.41 (1.71)

TABLE 4 | Assessment of construct reliability.

Construct	CA	Measurement instrument/item
Perceived usefulness	0.69	Teaching with digital learning media will worsen my course grades. Teaching with digital learning media has more advantages than disadvantages. The use of digital learning media in teaching is advantageous overall.
Perceived ease of use	0.62	My lecturers' instructions on how to use the digital learning media are difficult to follow. It is difficult to learn how to use the digital learning media in the learning process.
Behavioral intention	0.87	I intend to use digital learning media for self-study purposes in the next semester. I intend to use digital learning media in the next semester when preparing projects, papers and assignments.
Perceived enjoyment	0.92	Learning with digital media is pleasant for me. Learning with digital media is fun for me.
Attitude	0.82	I understand the crisis as an opportunity for the spread of digital education in universities. I welcome the increasing relocation of educational processes to virtual space, i.e., presence teaching being replaced by online teaching. I am confident that in the virtual semester, teaching content can be taught without major obstacles.
Learning flexibility	0.88	The use of digital media enables me to learn flexibly. The use of digital media enables me to learn in a self-directed way. **The use of digital media allows me to watch video lectures several times. (Item deleted after EFA)*
Time flexibility	0.79	Using digital media saves me time and resources on traveling to university. Using digital media optimizes my time management.
Social isolation	0.89	The use of digital media leads to socially isolated work. The use of digital media changes my direct communication with fellow students. The use of digital media changes my direct communication with lecturers.

PEOU constructs, internal validity was fulfilled for the constructs employed (≥0.7).

RESULTS

The overall results of the structural model test are shown in **Figure 2**. The model accounts for 65% of the variance in ATT and 54% of the variance in BI.

For all the model constructs, the significant factors were identified with the survey data. **Table 5** provides an overview of the hypotheses and the related results. With the exception of H1 (PEOU –> PU), all TAM hypotheses could be verified in our sample.

TABLE 5 | Summary of hypothesis tests.

Hypothesis	Coefficient (*p*-value)	Test result
H1: Perceived Ease of Use -> Perceived Usefulness	−0.06**	Not confirmed
H2: Perceived Ease of Use -> Attitude	0.17***	Confirmed
H3: Perceived Usefulness -> Attitude	0.34***	Confirmed
H4: Perceived Enjoyment -> Attitude	0.44***	Confirmed
H5: Perceived Ease of Use -> Perceived Enjoyment	0.25***	Confirmed
H6: Attitude -> Behavioral Intention	0.21***	Confirmed
H7: Perceived Enjoyment -> Behavioral Intention	0.41***	Confirmed
H8: Perceived Usefulness -> Behavioral Intention	0.74***	Confirmed

*** Significant at the 0.01-level and *** significant at the 0.001-level.*

Effects of Benefits and Disadvantages of E-Learning on PU

Two of the items in PU directly address the perception of the benefits or advantages of technology-mediated teaching. The third deals with the direct output of learning, which is related to its perceived effectiveness (cf. **Table 4**). Thus, we analyzed the data in view of the potential relations between the perceived benefits and disadvantages of technology-mediated teaching and PU. Based on our empirical results, we were interested in identifying the sentiments underlying students' perceptions of the usefulness of technology-mediated teaching. We therefore extended the TAM core model with the three new factors influencing PU, as presented in **Figure 3**.

Furthermore, we conducted a regression analysis of PU over time, as illustrated in **Table 6**. The effects of TF, LF, and SI explained 34% of the variance in PU in the model test (**Figure 3**), as well as up to 35% of the variance in PU over time (**Table 6**), with a very low explanation rate in May, which was also the only month when SI had a significant effect on PU.

Differences in the Perceptions of IS and M&A Students

To identify the differences between the two student groups, a Kruskal–Wallis test was performed. As a non-parametric test, the approach allowed us to identify differences among our subsamples of different sizes. **Table 7** depicts the test results for the model constructs.

Overall, all central model constructs vary between the student's subject. Moreover, in general compared with IS students, M&A students have more negative perceptions of almost all model constructs.

Differences in Acceptance Over Time

The differences in the central model constructs were analyzed in terms of variations over time and between subject groups. **Figure 3** shows the results for BI over time and between subject groups as generally higher for IS students and indicates further differences over time. For IS students, the analysis results reveal increased BI over time toward the end of the semester. For the

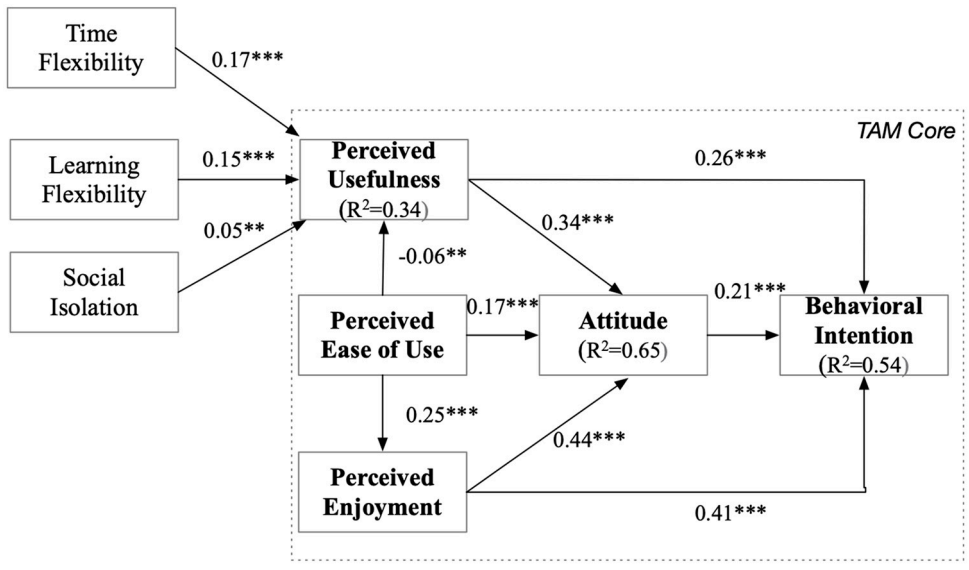

FIGURE 2 | TAM test results, including LF, TF, and SI as influencing variables. ** Significant at the 0.01-level and *** significant at the 0.001-level.

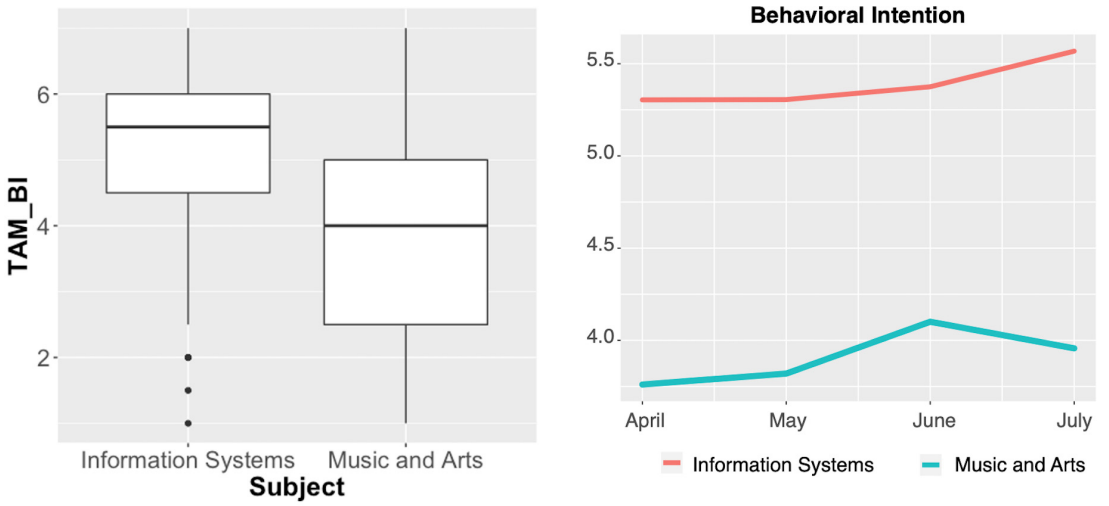

FIGURE 3 | Behavioral intention between subject groups and over time.

M&A group, we found similar increased BI over time; a slight decline was identified at the end of the semester.

The same tendency in development over time and in significant (see **Table 7**) differences between the subject groups was observed with regard to PU, PEOU, and PE (visualized in **Figures 4–6**, respectively).

As shown in **Table 8**, the model explains up to 59% of the variance in BI for IS students and up to 52% for M&A students. The effect of PU was not significant for both student groups at the beginning and at the end of semester and remained constantly non-significant for IS students. For M&A students, PU was very significant in the middle of the semester. The effect of ATT was significant in the beginning and the middle of the semester (June) for IS students but weakened over time. For M&A students, the effect of ATT also varied during the semester, being significant in the second month and at the end of the semester. The strongest and most constant significant effect was found for PE in both groups.

TABLE 6 | TAM regression explaining perceived usefulness.

Coefficients	R^2	Time flexibility	Learning flexibility	Social isolation
April	0.29	0.25***	0.12.	0.09
May	0.17	0.21***	0.07	0.09*
June	0.35	0.17**	0.34***	0.01
July	0.35	0.24**	0.20*	0.06

** Significant at the 0.05-level, ** significant at the 0.01-level, and *** significant at the 0.001-level.*

TABLE 7 | Identified differences in the perception between the students.

Construct	*p*-value Kruskal–Wallis test	Differences between M&A and IS
PU	$<2.2e^{-16}$***	Identified
PEU	$<8.54^{-6}$***	Identified
PE	$<2.2e^{-16}$***	Identified
ATT	$<2.2e^{-16}$***	Identified
BI	$<2.2e^{-16}$***	Identified
SI	<0.0003***	Identified
TF	$<2.2e^{-16}$***	Identified
LF	$<2.2e^{-16}$***	Identified

**** Significant at the 0.001-level.*

DISCUSSION OF THE RESULTS

In this study, we identified differences in the perceptions of the investigated subject groups and over time.

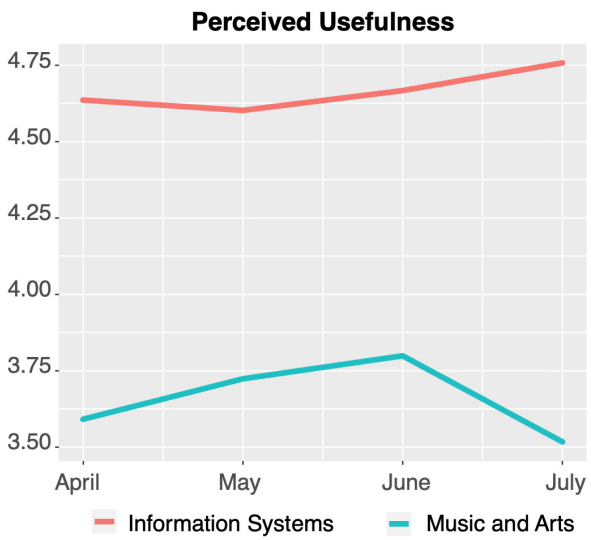

FIGURE 4 | Perceived usefulness of technology-mediated teaching over time.

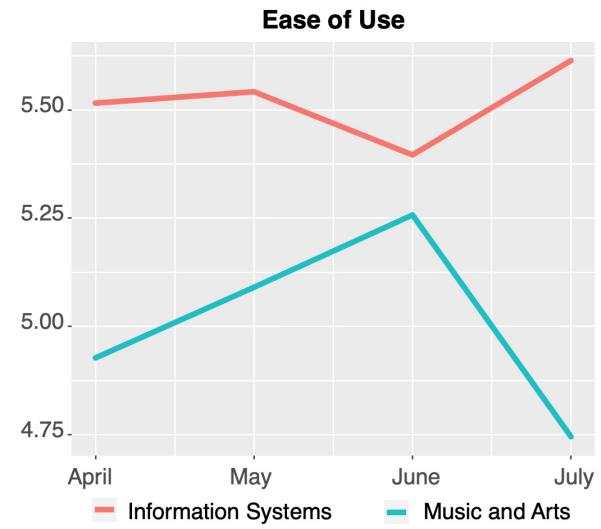

FIGURE 5 | Perceived ease of use of technology-mediated teaching over time.

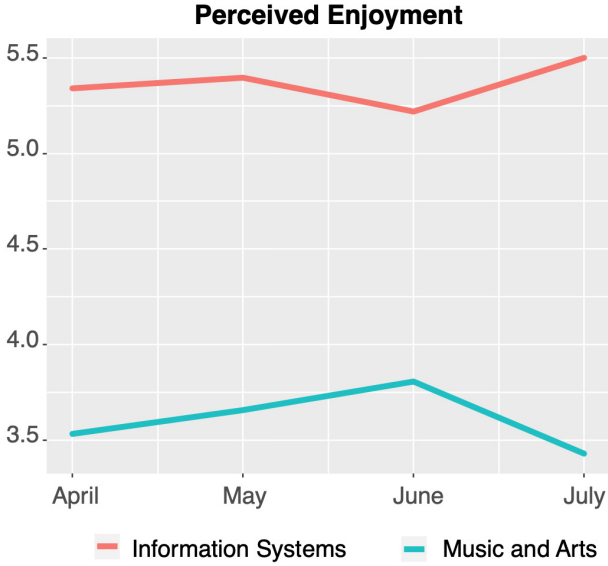

FIGURE 6 | Perceived enjoyment of technology-mediated teaching over time.

TABLE 8 | TAM regression results explaining BI.

	Information systems		Music and Arts	
	R^2	Coefficient	R^2	Coefficient
April	0.56		0.52	
TAM_PU		−0.14		0.40
TAM_Attitude		0.34***		−0.11
TAM_PE		0.57***		0.65***
May	0.52		0.40	
TAM_PU		0.02		0.29**
TAM_Attitude		0.23		0.21**
TAM_PE		0.59***		0.37***
June	0.59		0.48	
TAM_PU		0.58*		0.40***
TAM_Attitude		0.40*		0.12
TAM_PE		0.24		0.38***
July	0.49		0.52	
TAM_PU		−0.12		0.27
TAM_Attitude		0.11		0.43***
TAM_PE		0.75**		0.32**

** Significant at the 0.05-level, ** significant at the 0.01-level, and *** significant at the 0.001-level.*

The first research question (RQ1) could be answered positively: For all constructs of our model, the results show significant differences toward completely technology-mediated teaching depending on the discipline of study. In general, for all constructs, M&A students answer more negatively than IS, which leads to the conclusion that they will not accept (complete) technology-mediated teaching to the same extent as IS students. This supports, *inter alia*, our theoretical findings, especially the findings of Pike et al. (2012), which emphasized that students' academic majors were significantly related to levels of engagement, which is influenced by their acceptance and learning outcomes. IS students in our study furthermore enjoyed the technology-mediated teaching more, although social isolation was the most negatively indicated by both groups. Neumann (2001) emphasizes a strong influence of disciplines on students' learning and behavior, and Nelson et al. (2011) point out differences in facets of digital literacy and competency. Our findings empirically support disciplinary differences in acceptance of technical-mediated teaching between M&A and IS students. We assume a higher acceptance of IS to be a result of the appropriateness of the medium for the subjects' content and the confidence that the content of their lecture can be conveyed technologically, as well as based on general openness toward technology-mediated teaching. The higher acceptance of virtual classroom format might also be a result of the general tendency for people to adopt familiar formats more easily (cf. Janssen et al., 2009); that is, in the present case, IS students were more familiar with technologies and virtual environments than M&A students, and, thus, possibly influencing the corresponding acceptance.

To answer the second research question (RQ2), we analyzed differences over time and between the two groups. The results show that this research question was also positively answered: The students' attitudes toward completely technology-mediated teaching changed over time during the COVID-19 semester. Especially in the last month of the semester, a decline in all constructs was apparent for the M&A group. One reason for this finding may be that at this time, the loosening of social isolation had begun, and face-to-face teaching was possible again, clearly demonstrating its advantages for this group compared with completely technology-mediated teaching. A reason for M&A students' perception of technology-mediated teaching as much less suitable for conveying their learning content could be the lack of opportunities for laboratories and studios, audience response (in music and theater), and practical work in technology-mediated teaching, which are a main focus of their

curriculum. We assume that the type of knowledge imparted in the curriculum is also responsible for these differences.

Further, in the context of RQ2, we measured the effect of PE, ATT, and PU on BI separately for both groups using a regression analysis. Even if both groups did not rate the PU as high, the usefulness of technology-mediated teaching did not significantly affect the intentional behavior for any of the months of the survey. PU seemed to be important only for M&A students in the middle of the semester. This could be explained by the fact that at this time, M&A students had gained enough experience and recognized that the contents of their study cannot be transferred properly enough in a technology-mediated teaching environment. The intrinsic factor – enjoyment – however, has a decisive importance, with the remaining strong influencing effect for both groups. Further, the results show that PE was much lower for M&A students. This should be an object of further investigation focusing on variables influencing enjoyment of technology-mediated teaching. To address the special situation during this empirical study, the attitude toward technology-mediated teaching was placed in a close relation to the COVID-19 crisis. The effects on BI over time should therefore also be discussed in the context of the crisis. In the middle of the semester, the BI of both groups was significantly affected by the perception of the students regarding the influence of the crisis on the future digitalization of learning processes as well as on the current semester. At the end of the semester, however, IS and M&A students' responses developed in different directions – the experiences of IS students reduced this significant effect, although for the second group, the effect remained significant at the end. For this group, the lessons learned during the crisis are also more negative.

Besides the results related to RQ1 and RQ2, we provided results with regard to the TAM, which are in alignment with the results of our main theoretical underlying basis, Lee et al. (2005) as well as Venkatesh and Davis (2000). Significant effects could be confirmed in TAM core constructs. We identified in contrast to prior research an inverse effect of PEOU on PU. This might be explained by the fact that this was conducted during the COVID-19 situation, not voluntary, and we did not question the use of a specific technology, but rather technology-mediated teaching in general.

We identified a change of acceptance over time. Shehzadi et al. (2020) investigated the influence of e-learning of Pakistani public and private university students on their satisfaction in the context of the pandemic. Therein, a positive dependence of students' satisfaction with information and communication technologies, e-service quality, and e-information quality as influencing factors of students' e-learning experience was identified. This implies that specific technologies, the service quality, which is, for example, technological smoothness and a high degree of usability, as well as teacher and teaching characteristics, might also be decisive factors for consideration when (re)designing technology-mediated teaching and learning and, thus, addressing student acceptance.

We extended prior research introducing the new variables LF, TF, and SI to TAM and showed how they influence the PU of technology-mediated teaching learning. The possibilities to learn from home, save travel time, and access (video-recorded) lectures independently of time and place are universal benefits of technology-mediated teaching and learning that have gained importance under the special conditions of the lockdown period. Thus, it is not surprising that LF and TF were positively related to PU. The effect of LF was identified as significant in June (**Table 6**). TF had a strong effect during the whole lockdown period. Regarding the perceived disadvantages of technology-mediated teaching, our results show that SI had a surprisingly positive effect on PU. This could be explained by the situation of the complete lockdown, without alternatives to learning and direct exchange. There is evidence that the willingness to perceive technology-mediated teaching and learning as equivalent to face-to-face teaching and learning is greatest when offered without alternatives (Mehra and Omidian, 2011). The impact of SI on PU was strongest in the second month of the lockdown. This may be the result of the overall phase characteristics: during the second time, it became clear that the crisis would last longer, but the frustration about the social isolation was not yet too great by comparison.

IMPLICATIONS FOR TEACHING PRACTICE, EDUCATIONAL TECHNOLOGY AND FURTHER RESEARCH

The results of this study on technology acceptance during the virtual COVID-19 semester in Germany are important in both the short and the long term. We point out three areas of implications: teaching practice and organization, educational technology, and research.

Teaching Practice and Organization

Our study was conducted in a situation of immediate switch from physical presence to technology-mediated teaching. The extreme circumstances were a big challenge; however, they provided important evidence about technology-mediated teaching at universities. In the current course of the pandemic, the fall-winter 20/21 semester is equally or at least partially technology-mediated. In this respect, the findings can help improve teaching directly, especially regarding the differences in the perceptions of the subjects of study.

The differences between the student groups need to be taken into consideration by the teachers when designing virtual teaching and learning environments and conducting teaching. For example, different formats, such as breakout sessions in smaller groups, could be used. Furthermore, specific sensitization to the advantages or necessity of the formats can be applied or the degree of interactivity within the sessions adjusted. To this end, teachers should develop competencies, not only regarding the use of technical tools but also new didactic and methodological skills. Further, the overlap of technological, pedagogical and content knowledge leads to new kinds of interrelated knowledge (Mishra and Koehler, 2006; Archambault and Crippen, 2009; Schmid et al., 2020), which are gaining importance in the context of

teachers' education and professional development. The transfer of knowledge through teaching must not occur in such a way that a single technique implies innovation. It is much more challenging for lecturers to demonstrate their methodological and professional competencies through the use of media in the same way as in face-to-face teaching. The initial experiences during the COVID-19 lockdown have shown both possibilities and limitations. The students' direct feedback is all the more important to better exploit the potential of technology-mediated teaching in the future.

In the long term, not only direct teaching practices but also the organization of the teaching processes at the universities as a whole should be taken into consideration. Customized approaches, which differ in respective share of online and offline teaching and learning formats, should be considered for students of different subjects. Whereas, for example, IS students are more familiar with virtual environments, it is assumed that they are more likely to accept and manage the switch to fully virtual learning formats. By contrast, M&A students who are generally assumed to be less familiar with virtual environments may show less acceptance of related formats. Moreover, the appropriateness of virtual teaching and learning may also generally vary among subjects. The acceptance of virtual learning formats should not be considered as similar for all students simply referring to their age/generation. We argue for a consideration of their familiarity and competences with related technologies as well as their technological affinity, which varies among subjects. Moreover, we surmise that personal interaction may not be fully substituted through virtual formats. Hybrid teaching forms seem to become most promising for the future of learning and teaching at universities (Vladova et al., 2020). Therefore, administrative and organizational changes and reorganization of (well established) practices become necessary. These will involve adjustment and further development of the curriculum, stable and trustful technological infrastructure, organization of learning results assessment, as well as the development of a new culture of technology-mediated teaching, including netiquette, behavioral norms, and standards.

Educational Technology

The differences between the student groups clearly show that the use of technologies and the design of technology-mediated teaching offerings should address the specific needs of different study subjects. At the time of the study, communication platforms such as Zoom, Cisco Webex, or Big Blue Button were mainly used for teaching, as well as Moodle as a learning platform for organization of the teaching process. Against this background, the direct user feedback in our study includes important hints for educational technology (EdTech) companies. Currently, these companies mostly focus on the development of learning courses for individual use, pointing out the role of artificial intelligence (AI) and learning analytics. However, the results show the immense importance of the differences in the field of study during the transfer of knowledge in an academic environment. This can be addressed by short- and long-term solutions and may lead to innovative concepts and products, whereby the role of the teacher remains central for the transfer of specific study content. However, students can acquire different content in a completely self-directed and self-organized way. The curriculum of the two groups in our study can be used, among other things, to identify the subject-specific needs of the students.

Research

In the long term, the effects of LF, TF, and SI should be empirically tested and investigated by further research in a COVID-19 neutral situation. Furthermore, the changes in the TAM constructs over time refer to the influence of experience within the acceptance model in education. Thus, future research should investigate whether this experience can influence students' habits and, through this, their acceptance of face-to-face teaching. This is relevant for the phase of returning to direct face-to-face teaching after the crisis, but much more in the long term as university teaching becomes increasingly technology-mediated.

We also identified implications for further research in the context of knowledge management. The results of the study indicate a relationship between the nature of knowledge transferred during the teaching process and the acceptance of technology-mediated teaching. When the shift to the technology-mediated learning environment is considered, the nature of knowledge and how it is transferred comes to the forefront (Vladova et al., 2020). The knowledge management literature points out the critical distinction between tacit knowledge (person-bound) and explicit knowledge (not person-bound) (Polanyi, 1966). Whereas explicit knowledge can be transferred in the context of communication processes with the help of numbers, pictures, or language, tacit knowledge is personal and context-specific (Nonaka and Takeuchi, 1995). Therefore, tacit knowledge is difficult to communicate (Nonaka and Takeuchi, 1995) and can be transferred only partly and by common application and practice. For example, Polanyi (1958, p. 92) posits: "Although the expert (. . .) can indicate their clues and formulate their maxims, they know many more things than they can tell, knowing them only in practice, as instrumental particulars, and not explicitly, as objects."

Next, during our data analysis, we found some implications for research on the topic of innovation diffusion (Rogers, 2010), as IS students can probably be described as early adaptors and M&A students as the late majority. IS-students can thus be used as a test audience as well as ambassadors for a new learning technology solution. Thus, they would have a trendsetting role within universities. Thanks to their high acceptance, new technologies can be tried out without fear of resistance and their advantages can be recognized.

We also believe that our study could be of interest in the interdisciplinary research field, especially in the context of digital-mediated team, net, and project work. At this point, the experiences and needs of M&A students are especially important to explore. Experiments as well as surveys on these types of teamwork in the university context can provide necessary information on how technology-mediated teaching should be appropriately designed for this user group. This necessitates scientific collaboration between work psychologists, computer scientists and educators.

CONCLUSION

Although a study of this scale cannot be wholly representative of the entire higher education sector, it has provided views from two different disciplines, that is, M&A as well as IS, on the acceptance of technology-mediated teaching and learning in four universities in Germany. Motivated by the need to understand the underlying drivers of student adoption of digital-mediated learning during the COVID-19 semester, we applied the TAM in a longitudinal study and incorporated three new variables (LF, TF, and SI) influencing PU into the TAM. Furthermore, we identified differences between the subject groups regarding their perceived acceptance of digital-mediated teaching and showed the changes in BI over time for both student groups. We used a validated construct for acceptance. However, as we were aware of the specifics of the situation – social isolation and no alternative to the use of technology – we first tested the hypotheses using our sample.

Our study also has some limitations. First, it was conducted under the special circumstances of complete social isolation in every area of life, which has an influence on the results. Furthermore, we summarized the M&A group in the evaluation without consideration for the differences within it (e.g., music, theater, architecture, visual communication). Given the urgency and the circumstances of the situation of our empirical research context, we furthermore did not have the opportunity to directly examine the organizational situation at the participating universities. However, we included questions about digital platforms and tolls, as well as open-ended questions about students' perceptions of the performance of their teachers. Thus, we addressed organizational and technical issues and their impact on student acceptance. The answers to these questions are not the focus of this paper; however, they will help us to place the model in connection with the specific framework conditions at the universities and to analyze the answers more in depth.

In following up on our data analysis, our future research will especially address the changes on the individual level over time, further data collection in the current semester (fall-winter 20/21), and the analysis of the gathered qualitative data of the answers to the open-ended questions. These efforts will allow us to gain further information on students' perceptions of technology-mediated teaching during the semester.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical approval was not provided for this study on human participants because this was an anonymous survey, we used the own server for data administration. The participants provided their informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

GV developed the idea for this empirical research and was involved in all steps of the study and the manuscript preparation. GV and AU prepared the instrument applied in the empirical study. Both prepared a large part of the introduction, theory, and discussion of the results. GV was mainly responsible for the implications, AU for the conclusion. BB carried out the data analysis and described its procedure and results. NG was actively involved in the implementation of the survey and was responsible for the internal review process. All authors contributed to the article and approved the submitted version.

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

ATTACHMENT 1

H1: There is a positive relationship between perceived ease of use and perceived usefulness.
H2: There is a positive relationship between perceived ease of use and attitude.
H3: There is a positive relationship between perceived usefulness and attitude.
H4: There is a positive relationship between perceived enjoyment and attitude.
H5: There is a positive relationship between perceived ease of use and perceived enjoyment.
H6: There is a positive relationship between attitude and behavioral intention.
H7: There is a positive relationship between perceived enjoyment and behavioral intention.
H8: There is a positive relationship between perceived usefulness and behavioral intention.

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The Relationship Between Fear of COVID-19 and Online Aggressive Behavior: A Moderated Mediation Model

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Amid the COVID-19 pandemic, fear has run rampant across the globe. To curb the spread of the virus, several governments have taken measures to drastically transition businesses, work, and schooling to virtual settings. While such transitions are warranted and well-intended, these measures may come with unforeseen consequences. Namely, one's fear of COVID-19 may more readily manifest as aggressive behaviors in an otherwise incognito virtual social ecology. In the current research, a moderated mediation model examined the mechanisms underlying the relation between fear of COVID-19 and overt and relational aggressive online behavior among Chinese college students. Utilizing a large sample of Chinese college students (N = 2,799), results indicated that moral disengagement mediated the effect of fear of COVID-19 on college students' overt and relational online aggressive behavior. A positive family cohesion buffered the effect of moral disengagement on relational aggressive behavior, but only for females. The findings, theoretical contributions, and practical implications of the present paper are also discussed.

Keywords: fear of COVID-19, moral disengagement, family cohesion, online aggressive behavior, Chinese college students, COVID-19, coronavirus

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INTRODUCTION

In order to minimize the spread of COVID-19, the Chinese government advised citizens to stay home and avoid non-essential travel early in the pandemic. Under state-mandated orders for sheltering in place, much of social interactions and dissemination of news and information transitioned to online networks. Compared to the end of 2019, China's Internet traffic had increased by approximately 50% by mid-2020 (Liu, 2020). Although the internet brings convenience to our lives, it is inevitably accompanied by deviant behavior (e.g., online aggressive behavior). For instance, recent evidence suggests that approximately 59.47% of Chinese college students have participated in online aggressive behavior at one time or another (Jin, 2018) across various platforms, such as via social media and gaming (Wright, 2020). Aggression commonly manifests in two forms, (1) overt (i.e., confrontational acts) and (2) relational aggression (i.e., social gossip and interpersonal damage) (Crick, 1996; Zhao and Gao, 2012). Both types of aggression can result in severe psychological (Guo, 2016; Pabian and Vandebosch, 2016) and physiological consequences

to victims (Vaillancourt et al., 2017; Tozun and Babaoglu, 2018). Thus, while internet access has certainly made the transition to an isolated world amid the pandemic smoother, it has heightened our need to monitor the negative consequences of online aggression, particularly among the more tech-savvy youth.

Confronted by COVID-19's veil of novelty and uncertainty shrouding the outcomes of the future, fear has been a natural response by many affected individuals (Wang J. X. et al., 2020). Although negative emotion has been documented to be related to engagement in aggressive behavior (e.g., Song, 2019), no study, to the best of our knowledge, has examined the relation between fear of COVID-19 and engagement in online aggressive behavior among Chinese college students. Therefore, the aims of the present study were to examine and test whether fear of COVID-19 was significantly related to online aggressive behavior among Chinese college students and the underlying mediating and moderating mechanisms in this association.

Fear of COVID-19 and Online Aggressive Behavior

Fear has universally been documented and regarded as a key basic negative emotion, elusive in its influence on human behavior (e.g., Watson et al., 1988). During widespread events of public health emergencies, symptoms of negative mood disorders (e.g., fear, anxiety, depression) are common (Dai, 2014). Accordingly, fear has been documented to be pervasive and persistent amid COVID-19 (Wang J. X. et al., 2020). This atmosphere of fear, in turn, presents a troublesome preamble to the reality of the consequences befalling on the citizens' mental and physical health through pervasive state of heightened stress (Wang Y. et al., 2020). However, it is unclear how individuals cope with the sudden influx of negative cognition and emotion and what the social consequences are.

In recent years, several studies have linked fear and aggression in humans (Simunovic et al., 2013; Halevy, 2017; Mifune et al., 2017). However, such findings have often been relegated to examining preemptive aggression in response to anticipated prosecution from an antagonizing party. Fear of COVID-19 presents a unique and qualitatively different scenario in which fear may manifest into aggression. People naturally gravitate, whether willingly or otherwise, to seek to manage emotional problems and mitigate negative outcomes (Zillmann et al., 1974; Larsen, 2000). As young adults, college students may often lack the necessary life experiences and skills to cope with novel problems and instead engage in maladaptive coping strategies, such as aggression, to mitigate their negative emotions (Bitler et al., 1994; Sprott and Doob, 2000; Song, 2019). Indeed, although aggression has negative social consequences (Sun et al., 2016), it is a common maladaptive coping mechanism (Bushman et al., 2001; Roberton et al., 2012) particularly when one loses agentic control over their environment and seeks out compensatory control (Marcus-Newhall et al., 2000; Shoss et al., 2015). Marcus-Newhall et al. (2000) proposed that in the absence of the ability to directly tackle the antagonizing force, individuals may be motivated to displace their negative emotions toward otherwise innocent others. The consequences of pervasive COVID-19 related negative affect may further be accentuated by the only available outlet to individuals under lockdown–the internet.

During the COVID-19 outbreak, the Chinese government mandated residents to shelter at home to curtail the spread of the virus. This inadvertently increased internet traffic as residents spent more time online in the absence of in-person interactions. The anonymity of the internet can serve as a shield to protect aggressors from immediate consequences (Moore et al., 2012), further waning the psychological restraint one may self-impose for normative social interactions. Indeed, individuals have been documented to resort to use of foul language to vent their negative emotions on anonymous platforms (Dang, 2017). The anonymity afforded to people surfing the web may inadvertently make it easier for students to engage in online aggressive behavior without the normal accompanying guilt and restraint, regardless of whether that aggression is overt or more indirect (i.e., relational). Individuals may also be more easily triggered by potential aggressors given that a negative emotional state promotes more biased and cynical evaluation of others (Beukeboom and Semin, 2006). Although not yet empirically tested, there is reasonable conceptual rationale to expect that COVID-19 induced fears may lead to greater online aggressive behavior. Because the COVID-19 pandemic leaves little room for individual agentic control, induces fear amongst the populace, and has also forced many residents to shelter at home with only the internet as the gateway toward social contact, the current pandemic may have concocted the necessary reagents to stir a rather contentious virtual social ecology for human interactions.

Moral Disengagement as a Mediator

The relation between fear of COVID-19 and online aggressive behavior is unlikely to be a simple, direct one. The general aggression model (GAM) posits that personal and situational factors will influence internal states (Anderson and Bushman, 2002; Watts et al., 2017; Fang et al., 2020). Thus, drawing from GAM, moral disengagement may mediate the effect of fear of COVID-19 on online aggressive behavior. That is, as a moral guilt and regulation inhibitor, moral disengagement allows individuals to justify and reappraise their immoral actions, minimizing one's perceived role in the outcome of their actions or at least reducing the apparent distress stemming from what they cause to others (Bandura et al., 1996; Bjärehed et al., 2020).

Prior studies have long documented that negative emotions (e.g., anger) are related to greater tendency to morally disengage (Jin et al., 2017), possibly as a self-protective measure against any consequences stemming from negative emotion-driven actions (Anderson and Bushman, 2002). As a stateful cognitive orientation, moral disengagement is mutable in response to emotions and internal factors (Moore, 2008). Further, prior studies have documented that individuals with higher levels of moral disengagement are more likely to aggress against others (Bussey et al., 2015; Zheng et al., 2016; Mazzone et al., 2019) in forms of overt and relational aggression (Zhao and Gao, 2012). With internet communication abundant among youths, online aggression is considered a natural derivative of traditional aggression (Wong-Lo et al., 2011). Indeed, moral disengagement and negative emotions have been linked to

engagement in aggression in online settings through contentious online comments and cyberbullying (Pornari and Wood, 2010; Renati et al., 2012; Bussey et al., 2015; Runions and Bak, 2015; Wang et al., 2016; D'Errico and Paciello, 2018). Due to reduction of self-punishment and guilt, it may be easier for individuals to vent their emotions and stress on innocent people through negative online interactions (Pornari and Wood, 2010). Therefore, greater moral disengagement will likely lead to greater aggression and mediate the effect of fear of COVID-19.

The Moderating Role of Family Cohesion

Due to government mandated home quarantines, college students in China found themselves situated at home with their families during the pandemic. The family dynamic plays an important role for individuals' healthy psychological (Zhan and Li, 2019; Liu G. Z. et al., 2020; Liu T. et al., 2020), emotional (Olson et al., 1979, 1982), and individual development (Miller et al., 2000) through primary goal setting for successful achievement of a variety of basic, developmental, and crisis tasks (Skinner et al., 2000). Indeed, family cohesion comprises the emotional bonding between family members (Reeb et al., 2015) and serves as an important facet of proper socialization (Olson et al., 1979, 1982) which may be crucial in managing adaptive behavioral conduct and management. For instance, individuals who report experiencing higher levels of family cohesion and adaptability have also reported engaging in fewer problematic (Jiang et al., 2018) and aggressive behavior (Lu et al., 2019).

From the perspective of the organism-environment interaction model (e.g., Lerner et al., 2006), behavioral tendencies are formed and developed in the process of the interaction between individual and environmental factors. In our study, moral disengagement poses a risk factor for online aggressive behavior while family cohesion serves as a protective factor against risk (Bao et al., 2014). In other words, the effect of moral disengagement on both overt and relational aggression should be the highest for college students who report lower family cohesion within their households and lowest for those with high family cohesion. To date, no research, to the best of our knowledge, has examined family cohesion as a moderator of the indirect relationships between moral disengagement and online aggressive behavior.

The Present Study

The current research tested the relation between fear of COVID-19 and online aggressive behavior and whether moral disengagement mediated this effect. Although several studies have been conducted examining the antecedents of aggression in online interactions, these prior studies have typically operationalized aggression as a unidimensional construct despite evidence of multidimensionality in how aggression manifests (Crick, 1996; Zhao and Gao, 2012). Zhao and Gao (2012) posit that aggression may be overt (i.e., *direct aggression*) or relational (i.e., *indirect aggression*), in which the former pertains to confrontational acts whereas the latter more encompasses social gossip and interpersonal damage. Although there is little reason to hypothesize different direction or size of effects of the aforementioned study variables on overt and relational aggression, we provide exploratory analyses separating male and female participants given the history of studies on how aggression differentially manifest across genders (e.g., Björkqvist, 2018). We also tested the buffering effect of family cohesion on the relation between moral disengagement and both overt and relational aggression (**Figure 1**). Based on the literature review, we proposed the following hypotheses:

Hypothesis 1. Fear of COVID-19 is positively related to (a) overt online aggression, (b) relational online aggression, and (c) moral disengagement.

Hypothesis 2. Moral disengagement is positively related to both (a) overt and (b) relational online aggression and mediates the effect of fear of COVID-19 on (c) overt and (d) relational online aggression.

Hypothesis 3. Family cohesion buffers the effect of moral disengagement on (a) overt aggression and (b) relational aggression.

MATERIALS AND METHODS

Participants

Our study was approved by the Research Ethics Committee of the first author's institution. All participating college students provided informed consent. A total of 2,799 Chinese college students (M_{age} = 19.63, SD_{age} = 1.23, $range_{age}$ = 18–25, 70% female) anonymously completed the survey. Among the total sample, 1,402 (50.09%) were first years, 1,176 (42.02%) were second years, 128 (4.57%) were third years, and 93 (3.32%) were fourth years. A slight majority of the sample (n = 1,492, 53.5%) reported residency in urban settings.

Measures

Fear of COVID-19

Fear of COVID-19 was measured via a self-report scale. Participants rated 9 items (e.g., "I worry about being infected by others") on a five-point scale (1 = *never*, 5 = *always*), α = 0.91. Higher scores indicate higher level of fear. Confirmatory factor analysis (CFA) suggested that the one-factor model fit the data well; TLI = 0.99, CFI = 0.99, RMSEA = 0.05, 90% CI = [0.040, 0.054], SRMR = 0.02.

Moral Disengagement

Moral disengagement was measured via the Moral Disengagement Scale (MDS) [Detert et al., 2008; Chinese version revised by Wang and Yang (2010)], α = 0.90. Participants completed 26 items (e.g., "It is okay to tell small lies because they don't really do any harm") on a five-point scale (1 = *strongly disagree*, 5 = *strongly agree*) assessing eight dimensions of moral disengagement including (1) moral justification (4 items, e.g., "It is alright to fight to protect your friends"), (2) euphemistic labeling (3 items, e.g., "Talking about people behind their backs is just part of the game"), (3) advantageous comparison (3 items, e.g., "Stealing some money is not too serious compared to those who steal a lot of money"), (4) displacement of responsibility

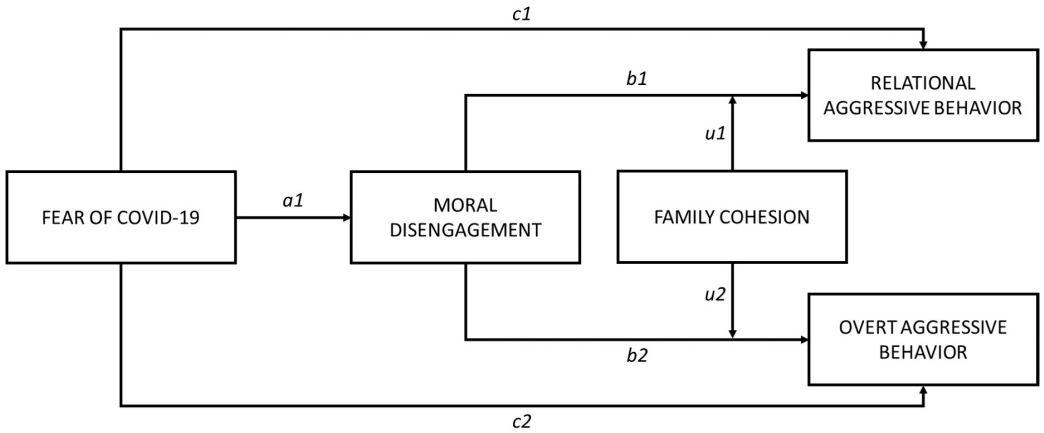

FIGURE 1 | Conceptual moderated mediation model.

(3 items, e.g., "If someone is pressured into doing something, they shouldn't be blamed for it"), (5) diffusion of responsibility (4 items, e.g., "You can't blame a person who plays only a small part in the harm caused by a group"), (6) distortion of consequences (3 items, e.g., "Insults don't really hurt anyone"), (7) dehumanization (3 items, e.g., "It is ok to treat badly someone who behaved like a 'worm'"), and lastly (8) attribution of blame (3 items, e.g., "People who are mistreated have usually done things to deserve it"). Higher scores indicated greater moral disengagement. The Chinese version of the scale has previously been used with Chinese participants with good reliability and validity (Liu et al., 2014; Liu and Liu, 2020).

Family Cohesion

Family cohesion was measured via the cohesion subscale of the Family Adaptability and Cohesion Evaluation Scale [FACES; Olson et al., 1982; Chinese version revised by Fei et al. (1991)], $\alpha = 0.89$. The scale consisted of 16 items (e.g., "When there are difficulties, family members will try their best to support each other"). Each item was rated on a 5-point scale (1 = *never*, 5 = *always*), with higher total scores indicating higher levels of family cohesion. The Family Cohesion Scale has been used with Chinese participants with good reliability and validity (Lin et al., 2018; Li et al., 2019; Li L. et al., 2020; Ye et al., 2019).

Online Aggressive Behavior

Online aggressive behavior was assessed by Adolescent Online Aggressive Behavior Scale (Zhao and Gao, 2012), $\alpha = 0.76$. The scale assessed two dimensions of online aggressive behavior including overt aggression (7 items, e.g., "I often abuse others when I play online games") and relational aggression (8 items, e.g., "I badmouth someone on the Internet with my friends"). All items were rated on a four-point Likert scale (1 = *never*, 4 = *always*). Higher scores indicated greater engagement in online aggressive behavior. The scale has been used with Chinese participants with good reliability and validity (Zheng et al., 2016; Jin, 2018).

Procedure

Due to government issued orders to shelter-at-home during China's early stages of the COVID-19 pandemic, questionnaires were distributed electronically via WeChat and QQ. The survey was hosted on Survey Star (Changsha Ranxing Science and Technology, Shanghai, China) from February 16 to March 1, 2020 and all responses were anonymous. Participation in the study was entirely voluntary and no compensation was given for their participation.

RESULTS

Preliminary Analyses

Fear of COVID-19 was positively correlated with both moral disengagement and online aggressive behavior while negatively correlated with family cohesion (**Table 1**). Moral disengagement was positively correlated with online aggressive behavior and negatively correlated with family cohesion. Family cohesion was negatively correlated with online aggressive behavior.

Testing for Mediation Effect and Moderated Mediation Effect

The conceptual model (**Figure 1**) was examined in Mplus 7.4 (Muthén and Muthén, 2015) and path coefficients are given in **Table 2**. Due to evident differences in the study variables across demographic factors (see **Table 1** and **Appendix Tables A,B**), each path controlled for gender, age, and urban/rural setting. The examined model using the total sample indicated good fit for overt aggression (RMSEA = 0.041, 90% CI [0.038, 0.044], CFI = 0.978, TLI = 0.973, SRMR = 0.039) and relational aggression (RMSEA = 0.038, 90% CI [0.035, 0.041], CFI = 0.981, TLI = 0.976, SRMR = 0.035) based on field-normative thresholds (Kline, 2011; Hoyle, 2012) (for visual representation, see **Appendix Figures A,B**). Fear of COVID-19 was positively related to moral disengagement but only directly related to relational aggression, supporting Hypotheses 1b-c while rejecting 1a. Moral disengagement was positively

TABLE 1 | Bivariate correlations of the study variables.

	M ± *SD*	1	2	3	4	5
1. Age	19.64 ± 1.24	–				
2. Fear of COVID	1.88 ± 0.66	0.18***	–			
3. Moral disengagement	1.37 ± 0.41	0.09***	0.23***	–		
4. Online aggressive behavior	1.05 ± 0.10	0.09***	0.16***	0.41***	–	
5. Family cohesion	4.14 ± 0.66	−0.04*	−0.08***	−0.13***	−0.14***	–

*N = 2,799, *p < 0.05, ***p < 0.001.*

TABLE 2 | Path coefficients across the total sample, male sample, and female sample.

	a		b		c		u	Indirect Effect
Predictor	*β*	***M***	*β*	**Y**	*β*	**U**	*β*	*β*
Total Sample								
Fear COVID	0.254***	Moral Dis.	0.327***	Overt	0.039	Fam. Coh.	−0.042	0.083***
Fear COVID	0.255***	Moral Dis.	0.461***	Relat.	0.077**	Fam. Coh.	−0.056*	0.118***
Male								
Fear COVID	0.255***	Moral Dis.	0.345***	Overt	0.073	Fam. Coh.	−0.031	0.088***
Fear COVID	0.255***	Moral Dis.	0.361***	Relat.	0.096*	Fam. Coh.	−0.013	0.092***
Female								
Fear COVID	0.268***	Moral Dis.	0.692***	Overt	−0.014	Fam. Coh.	−0.064	0.185***
Fear COVID	0.269***	Moral Dis.	0.740***	Relat.	0.064	Fam. Coh.	−0.162***	0.199***

*Fear COVID = Fear of COVID-19; Moral Dis. = Moral Disengagement; Overt = Overt Aggression; Relat. = Relational Aggression; Fam.Coh. = Family Cohesion; *p < 0.05, **p < 0.01, ***p < 0.001.*

related to both overt and relational aggression (β from 0.327 to 0.461, p both < 0.001), supporting Hypotheses 2a-b. Moral disengagement also, respectively, fully and partially mediated the effects of fear of COVID-19 on overt and relational aggression (β from 0.083 to 0.118, $p < 0.001$), supporting Hypotheses 2c-d. However, family cohesion only moderated the effect of moral disengagement on relational aggression ($\beta = -0.056$, $p = 0.019$) and not overt aggression ($\beta = -0.042$, $p = 0.065$), supporting Hypothesis 3b and rejecting Hypothesis 3a.

The male sample model indicated good fit for both overt (RMSEA = 0.039, 90% CI [0.032, 0.045], CFI = 0.986, TLI = 0.982, SRMR = 0.046) and relational aggression (RMSEA = 0.037, 90% CI [0.030, 0.043], CFI = 0.987, TLI = 0.984, SRMR = 0.043) (for visual representation, see **Appendix Figures C,D**). Across both models, moral disengagement mediated the effect of fear of COVID-19 on aggression (β from 0.088 to 0.092, $p < 0.001$). Fear of COVID-19 only showed a small direct effect for relational aggression ($\beta = 0.096$, $p = 0.013$) but not overt aggression ($\beta = 0.073$, $p = 0.062$). Family cohesion, however, did not moderate the path from moral disengagement to aggression (β from -0.013 to -0.031, p from 0.418 to 0.737). The female sample model likewise indicated good fit for both overt (RMSEA = 0.037, 90% CI [0.033, 0.041], CFI = 0.980, TLI = 0.975, SRMR = 0.037) and relational aggression (RMSEA = 0.036, 90% CI [0.033, 0.040], CFI = 0.981, TLI = 0.976, SRMR = 0.038) (for visual representation, see **Appendix Figures C**, **D**). Compared to the male sample models, moral disengagement fully mediated the effect of fear of COVID-19 on aggression (β from 0.185 to 0.199, $p < 0.001$). Family cohesion buffered the effect of moral disengagement on aggression, but only for relational aggression ($\beta = -0.162$, $p < 0.001$) and not overt aggression ($\beta = -0.064$, $p = 0.276$), partially supporting Hypothesis 3b.

DISCUSSION

Findings from this study showed that fear of COVID-19 was positively related to online aggressive behavior via moral disengagement. This finding, however, showed large variance across males and females. These results help to highlight the psychological processes of how fear of COVID-19 may lead to more online aggressive behavior among college students and has key implications for decreasing college students' online aggressive behavior amid the ongoing pandemic.

The Relationship Between Fear of COVID-19 and Online Aggressive Behavior

Results partially supported the hypothesis that fear of COVID-19 would be a positive correlate of online aggressive behavior, consistent with general findings on negative affect and aggression (Jiang, 2012; Song, 2019). Specifically, the direct effect of fear of COVID-19 on online aggressive behavior was only significant for males, and only for relational aggressive behavior. We originally hypothesized that the accumulation of fear of COVID-19 would lead individuals to aggress others in virtual spaces to relieve their negative affect and possibly cope with COVID-19 related concerns and stressors (Ma and Lei, 2010). The inconsistent effects observed in this study indicate that COVID-19 related

fears may be small factors on aggression but promotes the activation of moral disengagement – a key antecedent of aggression. This no doubt raises the need to monitor aggression in virtual spaces, as the spread of the virus has forced much of the population to transition to online for education or work. Indeed, the anonymity afforded to those in virtual spaces (Moore et al., 2012) can induce greater moral disengagement that promote different behavioral and emotional expressions on the internet than what one would otherwise partake in reality (Li, 2011; Li et al., 2012).

The Mediating Role of Moral Disengagement

The strong mediating effect of moral disengagement was robust across genders and subcategories of aggression behavior. The positive effect of fear on moral disengagement was consistent with prior literature (e.g., Caprara et al., 2013; Chen, 2016) and may reflect the cognitive motivation to seek methods to protect oneself when threatened (e.g., Cosmides and Tooby, 2000). Amid the pandemic, negative emotions from COVID-19 related concerns are likely to run high and may activate moral disengagement as a cognitive defensive mechanism (Paciello et al., 2012; Fida et al., 2015). The positive effect of moral disengagement on aggressive behavior was also consistent with prior studies on aggression (Runions and Bak, 2015; Liu and Liu, 2020) and cyber-bullying (Wang et al., 2016). In this study, moral disengagement likely served to justify or neutralize the self-restraining values that otherwise would deem antagonistic behavior as morally reprehensible. As online interactions commonly filter immediate feedback (e.g., facial, verbal) that normally trigger processing of guilt (Josnson, 2003), these online spaces may further provide fertile ground for easy moral disengagement.

It is worth noting, however, the prevalent variation in findings within our sample. Notably, moral disengagement fully mediated the relation between fear of COVID-19 and aggressive behavior for females. One possible explanation is the myriad of cultural norms that befall young girls in China. For instance, in China, it is generally less socially and culturally acceptable for females to exhibit aggressive behaviors (Li X. et al., 2020). Bound by the responsibility to adhere to social norms, it is plausible that females may have felt compelled to morally disengage and cognitively justify their aggressive behaviors more so than their male counterparts. This may partly also explain the larger effect moral disengagement had on aggressive behavior among female participants compared to male participants. That is, for females, moral disengagement may serve as a stronger requisite for surmounting the social restraints of "proper conduct" to aggress others compared to males who face less social and cultural demands. Another explanation may be that females may have been more empathetic of the individual they were interacting with, even with the anonymity that accompanies online social media. Indeed, as cyberbullies report lower levels of empathy (Renati et al., 2012), whether there are gender differences in how empathy may necessitate greater moral disengagement may be examined in the future.

The necessity for moral disengagement to overcome strict social guidelines may also partly explain the full mediation effect for overt aggression among males. Despite aggression being relatively more permissible for males than females in China (Li X. et al., 2020), because overt aggression entails strong, direct antagonization (Zhao and Gao, 2012), it may be such that moral disengagement still remains a strict requisite for more direct aggression among males. Nonetheless, the effect of moral disengagement on online aggression requires further cross-cultural replication. Specifically, the effect of moral disengagement on online aggressive behavior has been evidenced to be larger in Chinese culture compared to Western cultures (Wang et al., 2014). Future studies may test the robustness of the examined model across different cultures and societies.

The Moderating Role of Family Cohesion

The current study further found a partial support for the buffering effect of family cohesion on online aggressive behavior in accordance with the risk buffering model (Lerner et al., 2006; Bao et al., 2014). The conjecture was that those with greater family cohesion would be able to utilize their family as a resource for stress management in contrast to those with lower family cohesion who may feel the need to resort to online aggression as a form of maladaptive coping. Indeed, prior studies have evidenced that college students with weaker familial cohesion have reported feeling lonelier (Ren, 2020) and are more likely to attack others online (Sun et al., 2017). However, our study found that family cohesion provided limited protection. Specifically, this buffering effect was only significant among females against relational aggressive behavior. Like the case with moral disengagement, the Chinese social norms for gendered conduct may provide some insight. In China, males are often preached values of strength and traditional masculinity (e.g., "a man should strengthen himself [男儿当自强]," "real men do not easily cry [男儿有泪不轻弹]") and given lower emotional attention from parents during childhood development (Ye et al., 2020). Thus, one possibility may be that males may find it more difficult to utilize their families as resources for stress management compared to females who may readily receive more emotional support (Ye et al., 2020) and cope through productive dialogue (Tamres et al., 2002). This echoes the ongoing issue of toxic masculinity in negative mental health outcomes (Parent et al., 2019). Although the topic of toxic masculinity in China has been given less attention than in their Western neighbors, recent evidence has alluded to the prevalence of gender differences in how males and females are given familial attention and support (e.g., Ye et al., 2020). Should males be more hesitant in seeking adaptive coping strategies, it may be worth examining alternative modes with which they can obtain proper resources anonymously online to not incur any cultural or social backlash. Future research can further this inquiry by examining how cultural and social expectations may inhibit individuals from seeking or utilizing available resources in stress management.

Limitations and Future Directions

Several limitations must be considered when interpreting the results of the present study. Firstly, the present study was cross-sectional and causal inference is limited. However,

given that experimentally manipulating fear of COVID-19 may result in artificial fearmongering or downplaying of COVID-19, we recommend caution in designing future experimental studies. Future studies may instead seek to design longitudinal studies to better infer the temporal relation of the paths in this model. Secondly, all variables included in this study were measured via self-report scales. For topics like cyberbullying, participants may be motivated to underreport their actual engagement. Future studies may try to collect data from multiple informants (e.g., family members) or opt to using text-analysis methods to further nuance the current findings. It may also be interesting to examine whether there are parental support differences (i.e., support from mother vs. support from father) in mitigating aggression. Thirdly, the sample used in this study were entirely Chinese college students, limiting the generalizability of findings across cultures. Fourthly, individual factors (e.g., personality) were not measured in this study. In light of prior studies documenting personality to be related to aggression (García-Sancho et al., 2017; Bresin, 2019), future studies may aim to expand the current model by incorporating such variables.

Despite these limitations, the current study contributes to the body of literature by providing a conceptual basis for designing social interventions. In particular, academics and policymakers may seek to design interventions that address the negative emotions stemming from the ongoing pandemic as well as better engaging with one's moral values in online social interactions. Additionally, future studies may examine to what extent related, but distinct negative emotions (e.g., anger) may also result in increased aggression.

CONCLUSION

Although further replication and extension efforts are advised, this study represents an important step forward in unpacking how fear of COVID-19 may be related to the manifestation of online aggressive behavior among Chinese college students via moral disengagement. Although many societies have been working toward reopening their businesses and schools, the angst of COVID-19 will likely linger for much longer. For populations that regularly engage in social interactions in the virtual space (e.g., children, adolescents), self-monitoring may be crucial for maintaining a civil virtual social ecology. Moreover, the limited buffering effect of family cohesion for females in relational aggression warrants further examination of how males and females may respond to different types of stress coping resources. As our social lives will inevitable become more intertwined with the digital world, future research may help us to better understand how we may mitigate the manifestation of negative behaviors online.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Research Ethics Committee of Jiangxi Normal University. Participants all provided informed consent prior to participating in the current study.

AUTHOR CONTRIBUTIONS

BY acted as the Principal Investigator and oversaw the study in its inception to completion. BY, YZ, ML, XW, and QY were responsible for data collection, writing the manuscript, and conceptualizing the models. HI was responsible for writing the manuscript and conceptualizing the models. All authors contributed to the article and approved the submitted version.

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

APPENDIX

APPENDIX TABLE A | Gender differences across study variables.

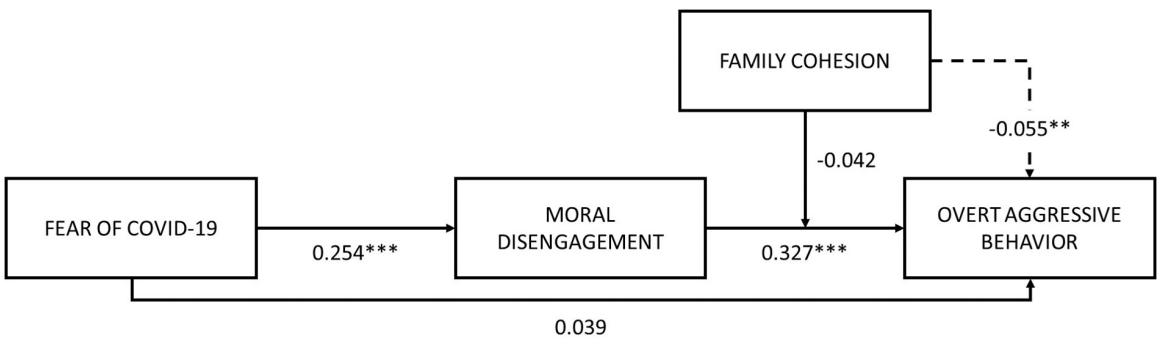
	Male		Female					
	M	*SD*	*M*	*SD*	*t*	df	*p*	*g*
Fear of COVID	1.81	0.75	1.91	0.62	−3.74	2797	<0.001	−0.151
Moral disengagement	1.47	0.55	1.34	0.33	7.79	2797	<0.001	0.319
Online aggressive behavior	1.08	0.17	1.04	0.05	10.05	2797	<0.001	0.395
Family cohesion	4.07	0.69	4.16	0.65	−3.51	2797	<0.001	−0.136

Males n = 821; Females n = 1978; g = Hedge's g.

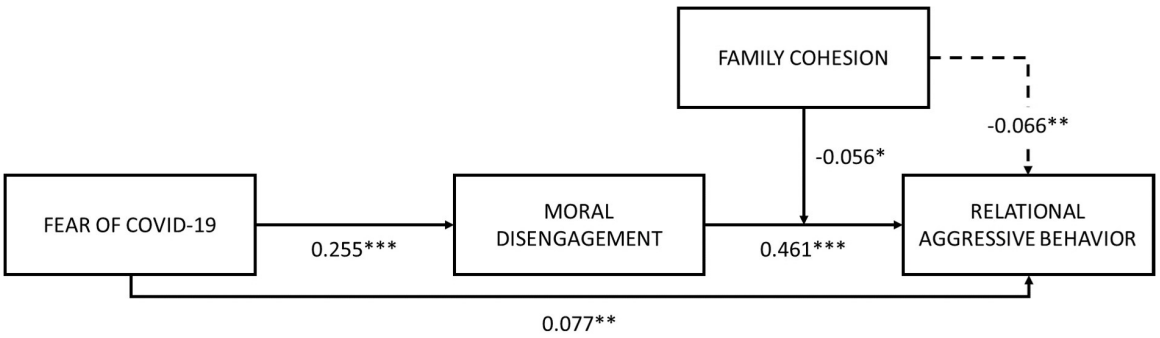
APPENDIX TABLE B | Environmental differences across study variables.

	Urban		Rural					
	M	*SD*	*M*	*SD*	*t*	df	*p*	*g*
Fear of COVID	1.84	0.65	1.92	0.67	−3.03	2797	0.003	−0.120
Moral disengagement	1.35	0.40	1.41	0.42	−4.04	2797	<0.001	−0.145
Online aggressive behavior	1.04	0.10	1.06	0.11	−3.89	2797	<0.001	−0.187
Family cohesion	4.17	0.68	4.09	0.63	3.27	2797	0.001	0.124

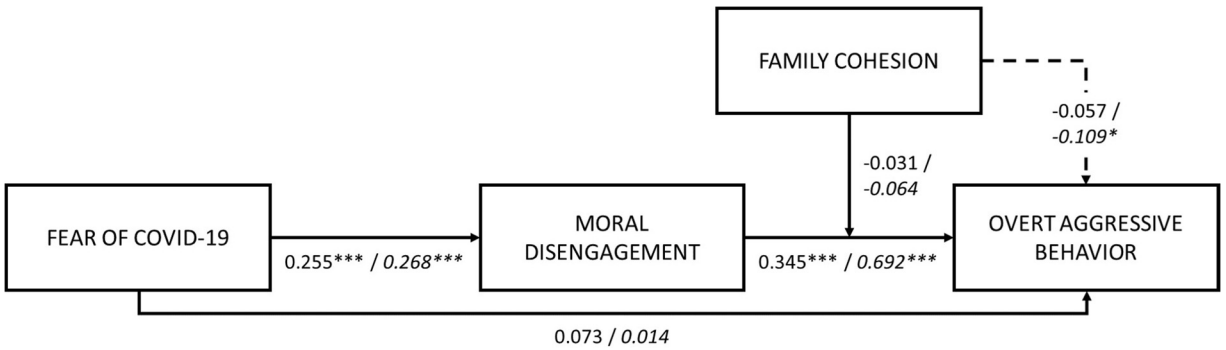
Urban n = 1492; Rural n = 1307; g = Hedge's g.



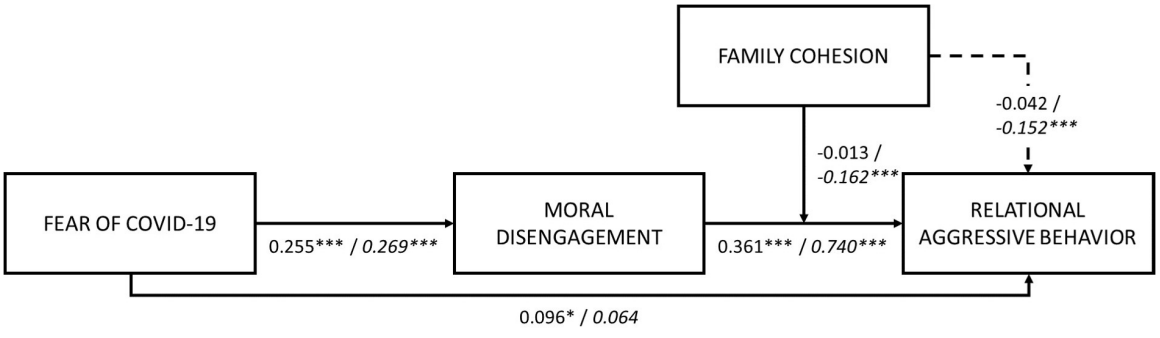
APPENDIX FIGURE A | Model 1 Total sample on overt aggression behavior. RMSEA = 0.041, 90% CI [0.038, 0.044], CFI = 0.978, TLI = 0.973, SRMR = 0.039.



APPENDIX FIGURE B | Model 2 Total sample on relational aggression behavior. *RMSEA = 0.038, 90% CI [0.035, 0.041], CFI = 0.981, TLI = 0.976, SRMR = 0.035*.



APPENDIX FIGURE C | Model 3 Male/Female samples on overt aggression behavior. Male sample (RMSEA = 0.039, 90%CI [0.032, 0.045], CFI = 0.986, TLI = 0.982, SRMR = 0.046); Female sample (RMSEA = 0.037, 90%CI [0.033, 0.041], CFI = 0.980, TLI = 0.975, SRMR = 0.037); female sample coefficients given in *italics*.



APPENDIX FIGURE D | Model 4 Male/Female samples on relational aggression behavior. Male sample (RMSEA = 0.037, 90%CI [0.030, 0.043], CFI = 0.987, TLI = 0.984, SRMR = 0.043); Female sample (RMSEA = 0.036, 90%CI [0.033, 0.040], CFI = 0.981, TLI = 0.976, SRMR = 0.038); female sample coefficients given in *italics*.

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Meaningful Learning Experiences in Everyday Life During Pandemics. A Qualitative Study

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The COVID-19 pandemic has drastically changed the lives of people all over the world. In particular, an unprecedented educational crisis has occurred due to the circumstances of physical distancing and remote learning. This article focuses specifically on the meaningful learning experiences in the everyday lives of adolescents during the pandemic. 72 meaningful learning experiences were identified from 11 participants who recorded their specific learning experiences for a week by a means of a journal recorded by themselves. A content analysis was undertaken in order to identify the ecology (what, how, where, and who with) of the different learning experiences. The results show a prevalence of personal and conceptual learning, a presence of both formal and specifically informal, everyday activities among the meaningful learning experiences detected, the importance of peers, teacher and "learning experiences while alone," and the use of digital technologies as learning resources; they also reveal the assistance of others in the learning process. The main contribution of this study illustrates how students in everyday life during pandemics are involved in a whole range of different activities both at school and at home.

Keywords: learning, education, digital life, COVID-19 pandemic, qualitative research

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INTRODUCTION

In recent decades, the impact information and communication technologies have on the transformation of both learning processes and educational practices has been documented (Jenkins, 2009; Coll, 2013; González-Patiño and Esteban-Guitart, 2014; Bender and Peppler, 2019; Gee and Esteban-Guitart, 2019). In particular, recently, different studies have documented the impact of remote education, as well as the emergence of hybrid models (online-offline), on educational inequalities, as well as teaching and learning processes (Arora and Srinivasan, 2020; Iglesias et al., 2020; Jena, 2020; Paudel, 2021). However, this literature did not address the impact of pandemics on learning experiences of the young. This article aims to contribute to the existing literature by considering the impact that the COVID-19 pandemic has on the meaningful learning experiences of young people from different socioeconomic and sociocultural conditions.

We understand meaningful learning experiences as being those that, due to their cognitive-emotional impact, the learner identifies as being especially relevant. Additionally, the learner grants a particular meaning to the set of recognized learning experiences achieved throughout the day, beyond the bounds of context and place where the learning experiences

occur (Esteban-Guitart, 2016; Esteban-Guitart et al., 2017). According to Esteban-Guitart (2016) meaningful learning experiences mean "those that the learner selects and chooses from his/her prior learning experiences, for their positive or negative impact. These experiences are the most relevant from the learner's point of view, for whatever reason, and are connected to their needs or interests" (p. 52).

Previous research suggests that educational times and spaces have both been modified and that this is mainly due to the porosity of digital practices and cultures. In this sense, we speak not only of learning throughout life but also life-wide: the result of participation in different contexts, situations and daily educational practices, both social and in the community (Esteban-Guitart et al., 2018). Based on the Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979), the notion of learning ecologies, in this sense, considers the set of physical and/or virtual activities, the help, collaboration and guidance of other people, as well as the different resources, inside and outside the school education context, as potential opportunities for learning available to a learner (Barron, 2004).

Taking the very notion of "learning ecologies" as a reference (Barron, 2004, 2006), Coll (2013) argues that we are facing a profound revision of the fundamental parameters that characterize educational practice (where, when, what, who with, why and how we learn). From a model focused on universal schooling, belonging to the twentieth century, we are now in a moment of transition toward distributed and interconnected emerging models. In this sense, we speak of "local learning ecosystems" (Hannon et al., 2019) to refer to a great multiplicity of interconnected educational scenarios and agents, linked to the development of basic competencies or skills for the 21st century, through participation in affinity groups or communities of practice, in different physical and digital mediums, as well as in distinct narrative formats (DiGiacomo D. et al., 2018; Lacasa, 2018).

In a previous study, the importance of informal situations and practices was identified, as generators of even school-type learning (aspects related to the science or history curriculum, for example); the importance of the peer group, and the "self-taught" situations—learning that one claims to have undertaken alone—, as well as in digital format (for example, YouTube, social networks, Internet content search) and from the participation in communities of affinity or interest, such as a Facebook group, or online gamers, as geography/format of a large part of the meaningful learning experiences identified in adolescents aged 15 and 16 (Esteban-Guitart et al., 2017).

These results are in tune with the literature linked to "connected learning" according to which, a large part of learning is currently generated from the link or connection between a certain interest and curricular, professional or civic opportunities, through collaboration and support from others, for example through social networks (DiGiacomo D. K. et al., 2018; González-Patiño and Esteban-Guitart, 2019; Esteban-Guitart et al., 2020a).

However, often these learning experiences that take place in non-formal or informal spaces of activity, are neither taken advantage of, nor linked to, the curricular type learning that takes place in school. "The majority of young people do not find ways to connect learning in their online affinity networks with in-school, civic, or career-relevant opportunities" (Ito et al., 2019, p. 2).

In any case, it seems clear that the opportunities and sources of learning today transcend the walls and borders of the school educational context and practice, as digital mobile devices allow access, construction and exchange of knowledge, skills, and competences. What Jenkins (2009) refers to as the concept of "participatory cultures" characterized by the ability to produce and exchange content and experiences through different media such as amateur videogame design, films or songs shared through YouTube, blogs, Facebook, Instagram, or other social and digital media.

The aim of the study presented here is to identify, and analyze, meaningful learning experiences experienced over the course of a week by 16 and 17-year-old adolescents during the COVID-19 pandemic situation in order to illustrate the potential impact of the pandemic situation on learning processes and ecologies.

MATERIALS AND METHODS

With the aim of achieving the aims of the research, and in accordance with the unit of analysis described in the introduction, meaningful learning experiences, a qualitative approach was used in the consideration of the identification and analysis of the subjectivity as a proposal for the generation of knowledge (Mruck and Breuer, 2003). In particular, and in the same line as previous research (Esteban-Guitart et al., 2017), a content analysis, described below, was carried out.

Participants

An intentional sample, deliberately chosen, of 11 participants was selected from a first-year high school class of 28 students from a state school in a neighborhood characterized by its high sociocultural diversity in Girona, Catalunya, Spain. The sample was composed of five boys and six girls between 16 and 17 years of age, balancing gender distribution. Of the total, six are of local origin (Catalan, Spanish), while five students come from abroad (two from Honduras, one from Colombia, one from Bolivia, and one from Morocco). The purpose was to reflect the diversity of both the school and context of the region. **Table 1** describes the sociodemographic characteristics of the participants. For reasons of confidentiality, a code was assigned to the different participants.

Table 2 additional data regarding the participants in relation to their learning ecologies (Barron, 2004), specifically the availability, or otherwise, of an Internet connection, together with available devices and usual practices carried out during the week as well as going to high school.

All participants have an Internet connection, as well as personal mobile phones and seven personally owned laptop computers, in four cases shared with either siblings or parents. With regard to after-school activities, what stands out are sports and physical activities. Two participants did not report doing any after-school activity during the week (see **Table 2**).

TABLE 1 | Sociodemographic characteristics of the sample.

Code	Age	Sex	Mother tongue	Origin	Parents' work
BCT001	16	Female	Castilian	Spain	Delivery man/Child educator
BCT002	17	Female	Catalan	Spain	Engineer/Sales representative
BCT003	17	Male	Catalan	Spain	Marketing Coordinator/R&D Biotech
BCT004	17	Male	Castilian	Colombia	Slaughterhouse operative/Cook
BCT005	17	Male	Castilian	Bolivia	Builder/Caregiver
BCT006	16	Female	Castilian	Spain	Cleaner/Rebuilding company
BCT007	16	Male	Castilian	Honduras	Carpenter/Baker
BCT008	16	Male	Catalan	Spain	Security guard/Careers advisor
BCT009	16	Female	Arabic	Morocco	Unemployed
BCT010	16	Female	Catalan and Castilian	Spain	Government employees
BCT011	16	Male	Castilian	Honduras	Truck driver/Cleaner

TABLE 2 | Some characteristics of the participants' learning ecologies.

Code	Age	Internet connection (devices available)	After-school activities
BCT001	16	Yes (mobile phone, laptop, and game console)	Physical exercise at home.
BCT002	17	Yes (mobile phone, shared computer, shared laptop, and game console)	Modern dance instructor in after-school activities.
BCT003	17	Yes (mobile phone, laptop, and game console)	Sport: rugby
BCT004	17	Yes (mobile phone and laptop)	Sport: soccer
BCT005	17	Yes (mobile phone, laptop, game console, and television)	Nothing reported
BCT006	16	Yes (mobile phone and shared laptop)	Mathematics class (school tutoring)
BCT007	16	Yes (mobile phone, shared laptop, game console, and tablet)	Sport: soccer
BCT008	16	Yes (mobile phone and laptop)	Cycling and physical exercise at home
BCT009	16	Yes (mobile phone, shared laptop, television, and game console)	Cycling
BCT010	16	Yes (mobile phone, laptop, and television)	Attending dance classes
BCT011	16	Yes (mobile phone, laptop, and game console)	Nothing reported

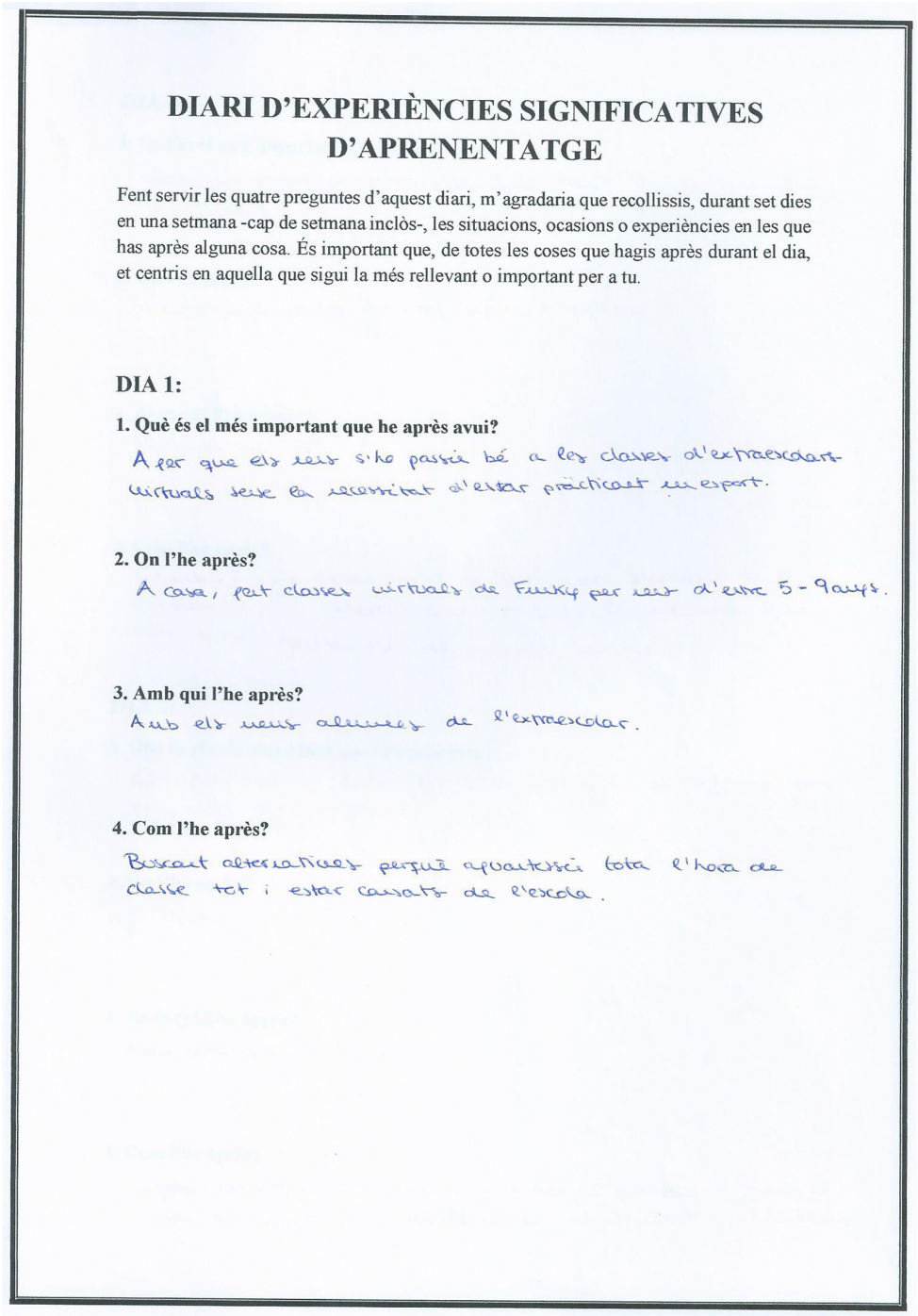
Instrument

With the aim of identifying meaningful learning experiences, an adaptation of the personal journal of meaningful learning experiences proposed by Esteban-Guitart et al. (2017) was used. The original version consisted of five questions, in our version we used four questions that the participants had to answer at the end of the day for a week (see **Figure 1**). Specifically, the data was collected between Monday, 25th January and Sunday, 31st January, 2021. The questions were: (a) What is the most important thing you learned today? (b) Where did you learn it? (c) Who with? (d) How did you learn it? The instructions were: "Using the four questions in this diary, I would like you to collect, over 7 days of a week—weekend included-, the situations, occasions or experiences where you learned something. It is important, that of all the things learned throughout the day, you focus on the one that is most relevant or important to you."

With the aim of identifying some of the characteristics of the participants' learning ecologies, information was collected *via* an on-line questionnaire. This information consisted of: the availability or otherwise of an internet connection, the digital devices available; as well as the after-school activities carried out during the week (see **Table 2**).

Procedure

Firstly, the study was approved by the research ethics and biosafety committee (CEBRUdG) of the University of Girona. Next, the research proposal was presented to the director of the school, and to the classroom teacher of the participants. After its approval, a sample of 11 participants was taken from the class group. They were contacted and informed of the purpose of the research, and authorization was sought to participate in the study based on informed consent. Once the instrument, a personal diary of meaningful learning experiences, was provided by the research team, the participants filled it out during the week of 25th–31st January, 2021. Finally, an on-line questionnaire was administered to each participant to identify the availability or otherwise of digital devices, the availability of an Internet connection, as well as the activities carried out during the week. During this period, classes were physically attended in the formal educational context with mask and hygiene measures, although 1 day a week, on Wednesday, classes were not attended in person and were held on-line. On the other hand, there was a situation of semi-confinement, since at that time there were measures affecting bars, cultural facilities and shops in the region of Catalonia. Specifically, non-essential shops were ordered to close at weekends, as well as shopping centers of more than 400 m^2. On the other hand, restaurants and cafes were allowed to open but only between the times of 7:30 a.m. to 9:30 a.m. and 1 p.m. to 3:30 p.m. There was a limitation to interior capacity of 30%. There was also confinement on a municipal level in that entering and



DIARI D'EXPERIÈNCIES SIGNIFICATIVES D'APRENENTATGE

Fent servir les quatre preguntes d'aquest diari, m'agradaria que recollissis, durant set dies en una setmana -cap de setmana inclòs-, les situacions, ocasions o experiències en les que has après alguna cosa. És important que, de totes les coses que hagis après durant el dia, et centris en aquella que sigui la més rellevant o important per a tu.

DIA 1:

1. Què és el més important que he après avui?

A per que els nens s'ho passin bé a les classes d'extraescolars virtuals serà la necessitat d'estar pràcticament en espera.

2. On l'he après?

A casa, per classes virtuals de Funky per nens d'entre 5 - 9 anys.

3. Amb qui l'he après?

Amb els nens alumnes de l'extraescolar.

4. Com l'he après?

Buscant alternatives perquè aquantessin tota l'hora de classe tot i estar cansats de l'escola.

FIGURE 1 | Example of a personal diary of meaningful learning experiences.

leaving Girona was restricted except for a justified reason. This measure affected the mobility of the population. One of the exceptions was that of attending school. However, all university lectures were online and face-to-face classes at the university were suspended.

Data Analysis

In order to analyze the empirical data obtained, thematic content analysis procedure was used with a deductive-inductive category system procedure in a round-trip iterative process between the data and the initial categories that were enriched and modified

from the analysis carried out (Vaismoradi and Snelgrove, 2019). In particular, an answer was found to the research question related to the characterization of the ecology (what, where, how, who with) of meaningful learning experiences. To do this, we initially based our research on the *a priori* categories developed by Esteban-Guitart et al. (2017) from the parameters of the new learning ecology described by Coll (2013). However, the category "what" was added, which was not analyzed in the study by Esteban-Guitart et al. (2017). It was decided to include this category because although it is contemplated in the parameters of the new learning ecology (Coll, 2013), it was not included in the research undertaken by Esteban-Guitart et al. (2017). This was considered to be a limitation in itself as it was not possible to obtain any analysis about the content of the meaningful learning experiences identified. In order to operationalize this category, the conceptual, procedural, and/or personal-identity learning contents were used. To this end, the learning types described by García-Romero et al. (2018), Lalueza and Macías-Gómez-Estern (2020), and Macías-Gómez-Estern et al. (2019) in research on the evaluation of the learning service by university students is used. In order to readjust the previous categories inductively based on the data obtained, inclusion criteria were introduced. **Table 3** shows these categories, codes and inclusion criteria finally used in the study.

In relation to the coding process, the codes that appear in **Table 3** have been assigned to the text segments of the diaries written by the participants about their meaningful learning experiences. This analysis allows collection of the frequencies of citations associated with the different categories and analysis codes.

"High intercoder reliability" (ICR) (Burla et al., 2008) is used in qualitative content analysis carried out for ensuring concordance in data analysis. In particular, transcripts were coded independently by two researchers from the categories, codes and inclusion criteria used (see **Table 3**) by two researchers, and ICR was calculated. A resulting kappa value of 0.91 can be regarded as solid.

RESULTS

A total of 72 meaningful learning experiences were identified as a result of the seven experiences that each participant has selected on each of the 7 days of the week; With the exception of BCT007

TABLE 3 | Categories, codes and inclusion criteria used.

Categories	Analysis codes		Inclusion criteria
What?	Conceptual		When the participant describes a theoretical type of learning, of facts and concepts. It includes the ability to identify, recognize, describe and compare objects, events or ideas.
	Procedural		When the participant describes learning based on actions and operations, either in practice or mentally. A set of ordered and completed actions, that is to say, aimed at the achievement of a goal. These include ability, technique, methods and strategies.
	Personal		When the participant describes learning related to values, attitudes or rules in relation to their own subjectivity. It includes beliefs, sentiments, preferences, actions and declarations of intentions.
Where?	Formal	Educational institution	When the participant describes learning as a result of participation in a formal educational institution and is physically inside the institution.
		From home	When the participant describes learning as derived from participation in a formal educational institution, but physically he or she is at home. This includes online classes and other activities derived from academic work or study.
	Not formal		When the participant describes learning as the fruit of an organized, planned educational activity undertaken outside the structure of the formal system. This includes activities that are not explicitly educational, but that contain components to support the learning process (training courses, free-time or sporting activities, extracurricular activities).
	Informal		When the participant describes spontaneous learning situations outside traditional educational institutions.
Who with?	AloneTeacher		When the participant reports learning while alone, without any other person present. This includes teachers as well as other professionals who are involved in formal teaching and learning activities, such as librarians.
	Peer group		Classmates, partner, and/or friends.
	Relatives		Legal guardians, fathers, mothers, brothers, sisters, uncles, cousins, grandparents.
	Other		Social or community agents.
How?	Cultural mediation		Traditional format: physical mediator such as a book, magazine, manual, etc.
			Digital format: physical mediator a digital resource or medium such as the Internet through a mobile phone, computer.
	Without cultural mediation		When the participant describes learning as a consequence of a reflective process without interaction with or use of any cultural artifact.
	Social mediation		Learning is described as a result of social interaction.
	Without social mediation		Learning is described as a result of personal work-reflection, without the explicit involvement of other people.

and BCT009, who stated, on 3 days in the first case and on 2 days in the second case, that they had not learned anything relevant throughout the day.

Regarding the content category of the meaningful learning experiences (the "What?"), the identity-personal subcategory stands out (with 32 citations), followed by conceptual (with 30) and procedural (with 10). Regarding the "Where?", the formal educational context stands out, either at the educational institution (24 associated citations) or at home (with six citations) but in activities, such as homework, extension of time, and homework. However, most meaningful learning experiences originated in informal contexts or situations. In relation to the "Who with?" The code that obtains a greater association of citations is "Alone," followed by the peer group and the teacher. To a lesser extent with the family. Finally, at the level of "How?" what stands out is the consideration of learning without any type of cultural mediation, without the use of artifacts; however, in the case of the use of artifacts, the digital format stands out. Finally, it is worth highlighting social interaction as a generator of a large part of the meaningful learning experiences, compared to self-learning (see **Table 4**).

For the purposes and context of this research, and of this monographic issue, the presence of COVID is highlighted in four of the meaningful learning experiences reported. As can be seen in **Table 5**, these are current issues in the pandemic period in which the study was carried out, for example, vaccines.

Taken as a whole, meaningful learning experience linked to identity-personal aspects (for example, linked to the organization of tasks, values or aspects linked to knowledge about oneself) have been derived from informal situations and contexts of life and activity. For example, BCT002 (day 5) claims to have learned that doing things in advance (for example homework) frees up time for leisure. The participant says she learned it alone, at home, specifically "doing all the homework she had for the following week in order to make the most of the weekend, even though we can't go out much." Meanwhile the curricular-conceptual type learning takes place in the formal sphere. However, conceptual learning carried out at home is also highlighted, acting as a support and extension of school activities, as well as derived from informal situations in seven of the total experiences with formal content (30). For example, derived from a chat with friends, BCT010 claims, on the second day, to have learned the

TABLE 4 | Citations associated with the different categories and analysis codes.

Categories	Analysis codes		Number of citations	Example
What?	Conceptual		30	"How (radio/TV/mobile phone) waves work" (BCT003, day 2)
	Procedural		10	"Make wireless earphones work" (BCT002, day 7)
	Identity-Personal		32	"That the person who loves you most is not the person who most tells you so" (BCT001, day 6)
Where?	Formal	Educational institution	24	"I learned what logic is and how to identify formal fallacies in philosophy class, at high school" (BCT010, day 4)
		At home	6	"I learned a lot about plastic elastomers for a class project at home" (BCT010, day 6)
	Not formal		3	"At home, doing virtual Funky dance classes for 5–9-year-old children" (BCT002, day 1)
	Informal		39	"I learned at home that there are non-parliamentary political parties" (BCT008, day 5)
Who with?	Alone		25	"Titanium is a very practical, useful material but the way to get it is very expensive, I learned this at home, alone, looking for information" (BCT005, day 3)
	Teacher		18	"The teacher taught me new calculator functions in class" (BCT009, day 5)
	Peer group		19	"I learned with my friends how to improve my playing skills in a competitive game" (BCT003, day 4)
	Relatives		7	"With my family, I learned how my parents drive" (BCT003, day 7)
	Other		3	"At the doctor's" (BCT011, day 1)
How?	Cultural mediation		3 (traditional format)	"In class I learned how to do trigonometric equations with the maths book" (BCT008, day 4)
			18 (digital format)	"Looking on the Internet how to install an application on the computer without having to pay and with no kind of virus" (BCT003, day 3)
	Without cultural mediation		51	"By listening in class, I learned that we have a set of chromosomes, in total 46" (BCT005, day 4)
	Social mediation		47	"In the street with friends, talking and thinking together, I learned the value of telling the truth and keeping promises" (BCT004, day 1)
	Without social mediation		25	"I learned that physical education is really necessary, after so much time without activity I thought about that" (BCT009, day 4)

TABLE 5 | Meaningful learning experiences associated with COVID-19.

BCT006 (day 3) WHAT: "COVID vaccines carry mRNA of itself" WHERE: "In online class" WHO WITH: "With a video of a medical scientist" HOW: "Looking at the video that they showed us in class"
BCT002 day 2 WHAT? "That in this country politics is more important than health" WHERE? "At home, looking at the television news" WHO WITH? "TV3 news" HOW? "Listening to how they said they were going to have an election in the middle of a pandemic and seeing how they apply the measures that they want without listening to health workers"
BCT006 day 2 WHAT? "Mental health depends on knowing how to manage the seven emotions that we may have during the day" WHERE? "At school" WHO WITH? "With the chemistry teacher" HOW? "We were in class talking about coronavirus and the different ways how it affects society"
BCT010 day 7 WHAT? "That the confinement and the different restrictions have affected each person in different ways and that means our priorities change" WHERE? "At home" WHO WITH? "With my sister" HOW? "Because she explained it to me"

equation of the trajectory of movement. However, the majority of conceptual learning took place in the school and was basically facilitated by the teacher. While learning carried out in informal life situations or practices is associated with situations in which the learner claims to be alone, or with peers—basically connected through digital devices. In relation to this, the use of social networks such as Instagram, video games, or search engines such as Google stand out. For example, BCT008, on the seventh day, claims to have learned to play 1-min games of chess with the computer, through an online chess game; or BCT007 (day 2) claims to have learned with Instagram that the first love one must receive is one's own love. In reality, a large part of the situations considered self-learning are characterized by the use of digital devices. For example, BCT003, on the third day, learned how to install an application on the computer without paying by searching for information on the Internet.

DISCUSSION

The exceptional situation, derived from the COVID-19 pandemic, has had an impact on different aspects of people's daily lives. The aim of the study presented here was to identify different meaningful learning experiences in the pandemic situation. In a previous study, the importance of informal learning situations and contexts was identified, as well as the importance of social and digital media as spaces for interaction and learning (Esteban-Guitart et al., 2017). This study is in tune with the previous study, despite the fact that the formal educational context also appears as relevant, perhaps as it is the main activity of young people, as well as being at home, as they are in a moment of semi-confinement; with restrictions in shops, bars and cafes and mobility. In fact, the study illustrates how the learning processes took place either in high school or at home. Highlighting learning undertaken alone. A situation that can also be explained due to the social restrictions of personal contact and mobility. However, a large number of the experiences have been categorized as resulting from social mediation (47) as opposed to those without social mediation (25), since the peer group at school and through their contact with digital devices is observed as an element which is highlighted from many of the meaningful learning experiences identified. This is in agreement with the work of DiGiacomo D. K. et al. (2018) that shows the importance of social and material conditions in the development of interests and learning objectives in adolescents and young people.

Compared with the study by Esteban-Guitart et al. (2017), the aforementioned difference in terms of the presence of the formal environment in meaningful learning experiences (not found in that study, and considerably significant in this one), the distribution and importance of the peer group, and the situations of "Being alone" are found to have the same trend. Although in this study, these situations increase proportionally, perhaps due to the pandemic situation, as well as the presence and importance of the teacher in such learning; this aspect was not identified in the previous study. Finally, in the "how," the presence of the digital format or tools and practices also stands out. It is important to highlight here that all the participants reported having an Internet connection as well as mobile phones and either shared, or unshared, laptop computers.

Regarding critical considerations of the study undertaken, it is necessary to consider that the qualitative nature of the study, involving 11 adolescents and young people, prevents us from reaching conclusions and generalizing the results to other contexts and situations. In addition, the categories of analysis should be reconsidered in future works, since due in large part to the porosity of digital media and devices, it is difficult to identify the border of the contexts. For example, BCT011, on the first day, claimed to have learned that they had Raynaud's Syndrome. He learned it, in fact, in a multiplicity of situations and contexts, after, as he describes it, talking with his doctor, searching on the Internet, consulting with his family and friends, and also especially from the "My Health" digital application. In the same way, learning from the formal, school environment, although it may begin in the context of the high school, continues through the internet, with the peer group and especially in this study described here, at home.

This consideration leads us to problematize the notion of context itself, understood as a physical and/or virtual environment, more or less defined in time and space, in which the learner participates directly, adopts different roles, activities and interpersonal relationships (Bronfenbrenner, 1979), toward procedural considerations that take into account the hybrid and porous nature of learning situations that in fact question the traditional separation between the formal and informal sphere (Jornet and Erstad, 2018; Esteban-Guitart et al., 2020b; González-Patiño and Esteban-Guitart, 2021). In any case, future research should trace, through for example, life stories and case studies, the parameters considered here under the metaphor of the new

learning ecology (Coll, 2013). The aforementioned research would allow us to go into greater depth regarding both the conditions and the characteristics of the learning experiences, as well as to overcome certain limitations of the categories used, for example in relation to the "how?" category. This is because by reducing this category to the mere presence or absence of cultural or social mediation does not allow for an in-depth documentation of the process of acquisition and development of the learning experience described.

CONCLUSION

The aim of the research was to examine the meaningful learning experiences throughout the unusual situation experienced during the COVID-19 pandemic. A content analysis was undertaken, following the same line of previous research (Esteban-Guitart et al., 2017). This made it possible to document 72 meaningful learning experiences of 11 adolescents from 16 to 17 years old. The meaningful learning experiences were collected for a week by means of a personal diary. Using the "new learning ecology" (Coll, 2013): what, where, who with and how learning happens, the content analysis was carried out. Concerning "what," the results show a prevalence of learning experiences related to subjectivity (values, attitudes, beliefs, sentiments, and preferences) and conceptual learning (learning of facts and concepts); concerning where, there is a presence of both formal and informal learning experiences; concerning "who with," the most frequent learning experiences are with peers, with teachers and alone; and concerning "how," the results show the relevance of digital technologies as learning resources. The main contribution of this research consists in the empirical documentation of the aforementioned parameters in the context of a pandemic. However, as this is a rather unrepresentative sample, in no way is it intended to make a generalization of the results found. On the other hand, a case study would allow for a greater depth of documentation of the learning experiences as well as their characteristics and conditions. Regarding practical applications, it should be noted that the learning experiences need pedagogical consideration, not just taking into account where they have originated, as this throws light on the situational and distributional character of the learning experiences. This aspect follows the line of previous research on the analysis of different situations in formal contexts, non-formal contexts and informal contexts as generators of meaningful learning experiences (Barron, 2004; Esteban-Guitart, 2016; Esteban-Guitart et al., 2017, 2018; DiGiacomo D. et al., 2018; Bender and Peppler, 2019).

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the research ethics and biosafety committee (CEBRUdG) of the University of Girona. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

ME-G conceptualized the research idea and planned the study. IG-C carried out the collecting data. MP and JS contributed to data analysis. ME-G, IG-C, MP, and JS contributed to the interpretation of the results. ME-G and IG-C wrote the manuscript. All authors provided critical feedback and helped shape the manuscript.

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Personality and Motives for Social Media Use When Physically Distanced: A Uses and Gratifications Approach

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This paper explores individuals' motives for using social media when living under 'social distancing' conditions imposed during the COVID-19 pandemic, where they were instructed to physically distance from other people. Adopting a 'uses and gratifications' approach, and using a previously established five-factor scale, we examine the relationship between individuals' motives for using social media and their personality traits. Hundred and eighty-nine social media users living in the United Kingdom completed surveys assessing their motives for using social media and their personality. Our findings demonstrate that participants were generally motivated to use social media to 'pass time' and to 'maintain relationships.' Further, we find that those high in extraversion in particular use social media to 'maintain relationships.' By comparing our findings to previous studies where face-to-face interaction was not restricted, our findings indicate that individuals' motives for using social media change when they are placed under physical distancing restrictions. We reflect on the potential application of our findings for others experiencing similar conditions, such as those working in remote locations, as well as the potential implications for living in a post-pandemic world with increased virtual 'meetings' using social media.

Keywords: Big Five, personality, motives, social media, uses and gratifications

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INTRODUCTION

In early 2020 the declaration of the COVID-19 pandemic let to unprecedented disruption to human interaction throughout the world. COVID-19 is a disease causing respiratory illness, resulting from infection through a novel coronavirus (World Health Organization, 2020). By July 2020 the pandemic had infected nearly 12 million people, and contributed to more than 500,000 deaths (Gutiérrez and Clarke, 2020). In response, many countries introduced laws and guidelines to restrict human interaction, referred to as 'social distancing' (United Kingdom [UK] Government, 2020a), intended to limit the spread of the virus. Although 'social distancing' is the term used by the United Kingdom government, the intention was to encourage individuals to 'physically distance' from each other, by restricting who they meet up with and by maintaining a 2-m distance from others in public spaces (United Kingdom [UK] Government, 2020b). In the United Kingdom, this led to a nationwide 'lockdown' requiring the population to remain at home where possible (United Kingdom [UK] Government, 2020c). This deliberate effort to restrict face-to-face contact

to vital functions, such as performing 'key work' (i.e., those providing essential services such as nurses, teachers, police officers etc.) and shopping for basic necessities, inevitably applied significant limits on communication. Specifically, although many employers and educational institutions moved their activities to online environments such as Microsoft Teams and Zoom, many people also chose to communicate with one another socially during this 'lockdown' period using online communication channels in place of physical social engagement.

A wide range of evidence suggests that social media use increased following the physical distancing measures mandated in response to COVID-19. This included increased daily and monthly active use of Facebook (Facebook, 2020), a doubling of visitors to TikTok within the United Kingdom (Ofcom, 2020a) and more than doubling of weekly video calling using platforms such as WhatsApp, Facebook messenger, and Instagram (Ofcom, 2020a). Yet, although this evidence suggests that the increases in social media use may be a consequence of the pandemic, the numbers themselves do not explain why. So, why would the conditions of a pandemic motivate individuals to increase their use of social media? This paper therefore explores the motives for social media use under physically distanced conditions, paying specific attention to the relationship between motives and personality traits.

Previous studies have demonstrated that motives for using social media platforms can be driven by a range of desired 'uses' or 'gratifications' (such as Joinson, 2008). However, as well as differences in motivation, social media usage also varies according to individual characteristics such as demography (see Gil-Clavel and Zagheni, 2019) and personality traits (such as Bowden-Green et al., 2020). Indeed, these individual characteristics have been shown to affect motivation (Hollenbaugh and Ferris, 2014), thus in turn leading to the observed differences in usage.

Uses and gratifications theory developed as a means of understanding individuals' motivations to receive communication via a given medium. A uses and gratifications approach acknowledges that an audience actively chooses the media it receives (Katz et al., 1974), linking a need for gratification with the choice of a specific medium that will satisfy the need. This assumes that people are 'sufficiently self-aware' to accurately report their 'interests and motives' (Katz et al., 1974). Katz et al. (1974) outlined 'social' factors that might create a need for media use. Others focus on satisfaction of individual needs (McQuail et al., 1972; Rosengren, 1974), such as 'belonging,' 'esteem,' and 'self-actualization.'

Following the establishment of uses and gratifications theory, the approach has been applied to a variety of media types (see Ruggiero, 2000 for a review). Among the well-cited contributions, Katz et al. (1973) demonstrated that specific mass media satisfy specific social and psychological needs, for example identifying that "books" satisfy a need "to escape from the reality of everyday life." Although most early research focused on 'traditional' broadcast and print media, Perse and Courtright (1993) later added computers to the potential media for which uses and gratifications were identified. As the media landscape has evolved, recent work has focused specifically on a range of social media including Facebook Groups (Park et al., 2009), Everything2.com (Lampe et al., 2010), and Qzone (Apaolaza et al., 2014). Yet, as Facebook has grown to become the world's largest social media platform (Statista, 2020), most recent research has focused on understanding motives for Facebook use. Early research identified the desire to find new and old friends (Raacke and Bonds-Raacke, 2008) on both Facebook and MySpace, although a range of specific uses and gratifications factors have since been developed for researching social media motivation (such as Joinson, 2008; Sundar and Limperos, 2013). As well as a general motivation for Facebook users to 'pass time' and seek 'relaxing entertainment' (Papacharissi and Mendelson, 2011), findings for Facebook to date also include 'content gratification' as a motive for those spending a long duration online (Joinson, 2008), and a need for 'social connection' among high-frequency users (Joinson, 2008). Excessive users of social networks, however, are driven by diversion, self-presentation, and relationship building (Chen and Kim, 2013).

Specific functions within each platform are also linked with specific motives, such as commenting relating to a desire to socially interact and to seek relaxing entertainment (Smock et al., 2011), and status updates being driven by a desire to share information (Smock et al., 2011), form relationships, and maintain relationships (Yang and Brown, 2013).

In contrast to the extensive body of work on uses and gratifications generally, research that compares social media uses and gratifications with personality traits is limited. Results to date suggest that individual personality characteristics alter the motives for using social media as users seek different benefits, such as those higher in agreeableness seeking a 'Virtual Community,' and those higher in Openness seeking 'Relationship Maintenance' (Ferris and Hollenbaugh, 2018). In the context of physically distanced situations, the current study therefore seeks to understand how personality traits affect the desire to use social media, given that many needs, such as social interaction, cannot be fulfilled offline.

The identification of personality traits according to the five-factor model is based on initial analysis of language used to describe people. One of the first pieces of research studied all 18,000 personality descriptors in the English dictionary, identifying 4,500 of these as 'personality' (Allport and Odbert, 1936). Using cluster analyses and factor analysis, 4,500 traits were reduced to just 35 variables, contributing to five 'factors (Fiske, 1949): Extraversion (or introversion), agreeableness (or antagonism), conscientiousness (or lack of direction), neuroticism (or emotional stability), and openness to experience (versus closeness). These are now known as the 'Big Five' (Goldberg, 1981).

McCrae and Costa (2003) recognized that within these five 'factors' are many more behavioral 'facets.' For example, expressing feelings (such as excitement) is a behavioral facet of 'openness to experience.' Various multi-item questionnaires have been suggested to test the presence of each facet and then score participants against these five overall factors. These include

the 44-item Big Five Inventory [BFI] (John et al., 1991), 50-item questionnaire (with 10 bi-polar adjective scales per factor) (Goldberg, 1992), 60-item neuroticism, extraversion, openness five factor inventory [NEO-FFI] (Costa and McCrae, 1992), 100-item questionnaire (unipolar) (Goldberg, 1992), and the 240-item neuroticism, extraversion, openness [NEO] personality inventory (Costa and McCrae, 1992).

Using a variety of personality questionnaires (through which respondents self-report their personality), there is lots of evidence to suggest that behavior on social media is linked to personality traits (Ong et al., 2017). For example, a large body of research has discovered relationships between personality traits and 'posting' content (Ong et al., 2011; Bachrach et al., 2012; Wang et al., 2012; Lee et al., 2014; Shen et al., 2015; Cheevasuntorn et al., 2017; Yoong et al., 2017; Casado-Riera and Carbonell, 2018; Mo et al., 2018; Seidman, 2019), 'liking' others' content (Bachrach et al., 2012; Lee et al., 2014; Marshall et al., 2015; Shchebetenko, 2019), and 'commenting' (Gosling et al., 2011; Lee et al., 2014; Marshall et al., 2015; Wang et al., 2018). There is therefore a large body of evidence to suggest that relationships exist between traits and social media behavior. Specific trends in the findings include people with high trait neuroticism posting longer updates (such as Bai et al., 2012) and negative emotions (such as Kern et al., 2014); whereas those high in extraversion tend to use positive words (such as Hall et al., 2014), use social media frequently (such as Correa et al., 2010) and regularly post content (such as Bachrach et al., 2012). For reviews of these findings, see Bowden-Green et al. (2020, 2021).

Reflecting previous offline studies linking traits with motives for offline media use (such as Finn, 1997; Krcmar and Kean, 2005), Hollenbaugh and Ferris (2014) then sought to understand people's motives for using social media. Among the relationships identified in research to date, extraversion has been linked with the motive to connect with new friends (Bhattacharya et al., 2014; Orchard et al., 2014) and existing peers (Bhattacharya et al., 2014), and to share information about themselves (Mishra and Ayatham, 2017). Krishnan and Atkin (2014) also demonstrated that, for those high in extraversion, infotainment was likely to be a motive for using social networks. Although people with high trait neuroticism tend to have small social networks, social interaction is a motivation for individuals to use social media (Hughes et al., 2012). Neuroticism also relates to social media use as a means of escapism (Orchard et al., 2014) or as a means of coping with pressure (Marino et al., 2016), with social media satisfying a desire for acceptance and inclusion (Marshall et al., 2015). Openness has been related to use of social media to connect with like-minded people and find new friends (Bhattacharya et al., 2014), use social networking sites for learning (Chou and Chiu (2015) and sharing information Marshall et al., 2015), and to search for products (Bhattacharya et al., 2014; Mishra and Ayatham, 2017). Those high in agreeableness are also likely to use social media to maintain relationships (Horzum, 2016) and to use Pinterest specifically to entertain and inform themselves (Lin et al., 2017). Conscientiousness has been associated with a motive to connect with peers (Bhattacharya et al., 2014) and maintain relationships (Horzum, 2016).

Yet, although motives for social media use were identified in a recent study (Ferris and Hollenbaugh, 2018) for agreeableness (joining a 'Virtual Community'), neuroticism ('Companionship'), and openness ('Companionship,' 'Exhibitionism,' and 'Relationship Maintenance'), neither this study nor a previous study using the same 'uses and gratifications' scale (Hollenbaugh and Ferris, 2014) identified a significant motive for use of social media by those high in extraversion. This is despite other measures suggesting that people high in extraversion need to 'connect' (Bhattacharya et al., 2014; Orchard et al., 2014; Scherr and Brunet, 2017), communicate (Marshall et al., 2015; Horzum, 2016), and socially interact on social media (Eşkisu et al., 2017; Lin et al., 2017).

Although there is no direct comparison to conditions during a pandemic, previous studies have related Big Five personality traits to other situations of social isolation. Findings include increased feelings of loneliness for those scoring higher for neuroticism (Wang and Dong, 2018), but decreased feelings of loneliness for those scoring higher for conscientiousness (Wang and Dong, 2018; Buecker et al., 2020), extraversion and agreeableness (Buecker et al., 2020). Further, introverts have been found to perform well cognitively in isolated environments such as the Antarctic winter (Rosnet et al., 2000), when tested against a range of measures including memory, grammatical reasoning, and reaction time. These limited findings suggest that in situations of enforced physical distancing, introverts may feel comfortable when face-to-face interaction is restricted, whereas those scoring highly for neuroticism may not.

Studies of social media use during the current COVID-19 pandemic are understandably limited in number so far, however, these limited findings have tended to focus on the dissemination of information (Depoux et al., 2020; Islam et al., 2020; Rosenberg et al., 2020; Naeem, 2021), social media discourse (Chen et al., 2020; Koh and Liew, 2020), and mental health, such as anxiety (Ahmad and Murad, 2020; Wheaton et al., 2020; Zhao and Zhou, 2020). We have identified very few studies on specific social media use patterns (Drouin et al., 2020). We believe our study will be the first during the pandemic to focus on motives, with particular comparison to pre-pandemic conditions.

In this exploratory study, we examine whether previously established relationships between motives and individual characteristics, such as personality traits, have altered under physically distanced conditions. This study seeks to explore whether the evidence of increased social media use (Facebook, 2020; Ofcom, 2020a) is driven by specific motives and in turn by specific personality traits. Based on these findings, we therefore seek to answer the following questions:

RQ1: What are people's motives for using social media when instructed to physically distance?

RQ2: Does personality predict motives for using social media when instructed to physically distance?

RQ3: How do personality traits relate to use of specific social media platforms when instructed to physically distance?

MATERIALS AND METHODS

Participants

Participants were recruited through the Prolific online data collection tool[1] and received £2 payment for their completion of the questionnaire. Prolific is an online participant recruitment tool, enabling researchers to recruit carefully screened participants for online research. Participants who have already signed up to participate in online research are invited to take part in specific studies via email if they meet the demographic requirements of the researcher. A total of 218 responses were received. Twenty participants did not fully complete the questionnaire. A preliminary question assessed social media use to ensure that participants were social media users; nine participants were removed as they did not use any of the top ten social media platforms. After also removing incomplete responses, the sample size was 189.

All participants were adults aged between 18 and 75 years (M = 36, SD = 13.6), who were living in the United Kingdom at the time of the study. Testing for skewness revealed a score of 0.83, indicating that more of our participants were at the lower end of our age range. Hundred and sixteen (57%) were male and 82 (43%) female.

Procedure

Survey

Participants completed an online questionnaire created in Qualtrics that took around 20 min to complete. Data were collected on 18th and 19th May 2020 during the first national 'lockdown' in the United Kingdom. The survey comprised a personality test plus a series of questions regarding their motives for social media use since 23rd March 2020 when physical distancing measures were first instructed by the United Kingdom government (United Kingdom [UK] Government, 2020b). All participants gave consent for this data to be used for research purposes, and they were informed that they were free to withdraw at any time. All data collected were anonymous. Ethical approval was granted by the School of Management's Ethics Committee at the University of Bath prior to undertaking this research.

Instruments

The online questionnaire measured motives for using social media using the 24-item scale created by Hollenbaugh and Ferris (2014). As described by Hollenbaugh and Ferris (2014), this scale is the result of factor analysis on 39 items, originally comprising items from Sheldon (2008), Barker and Ota (2011), and Hollenbaugh (2011). The resulting five factors included measurement of 'Virtual Community' with seven items assessing the use of social media to forge new relationships, 'Companionship' with five items assessing social media use to compensate for loneliness, 'Exhibitionism' with five items assessing the use of social media to get attention, 'Relationship Maintenance' using five items to assess social media use to sustain existing relationships, and 'Passing Time' using two items to assess the motive to relieve boredom through social media use.

[1] www.prolific.co

Participants responded to 24 randomized statements using a Likert scale (*Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree*). The answers then contributed to five previously established factors (Hollenbaugh and Ferris, 2014): participating in a 'Virtual Community,' seeking 'Companionship,' 'Exhibitionism,' 'Relationship Maintenance,' and 'Passing Time.' According to Ferris and Hollenbaugh (2018) the scale has good internal consistency, with a Cronbach's alpha coefficient reported of α = 0.89 for 'Virtual Community,' α = 0.94 for 'Companionship,' α = 0.90 for 'Exhibitionism,' α = 0.87 for 'Relationship Maintenance,' and r = 0.66 for 'Passing Time' (two items). In the current study, the overall Cronbach's alpha coefficient was α = 0.88 for 'Virtual Community,' α = 0.91 for 'Companionship,' α = 0.84 for 'Exhibitionism,' α = 0.81 for 'Relationship Maintenance,' and r = 0.70 for 'Passing Time' (two items). Although the Hollenbaugh and Ferris (2014) scale was originally used to assess motives for using Facebook specifically, the current study sought to understand motives for a range of social media; therefore, the word 'Facebook' was replaced in the questions with the broader words 'social media.' Participants were asked to signal the extent to which they agreed with each of the 24 statements describing their motives for social media use since 23rd March 2020.

In order to relate these motives to use of specific social media, duration data was collected to provide an objective measure of social media use. Apple introduced a feature called 'screen time' for iPhones running version 9 of its operating software onward. This enables users to report their weekly time spent on each app, for specific functions in general, and on the phone as a whole. Therefore, those participants who use Apple iPhones as their primary device for social purposes were also asked to report data for use of each of the ten largest social media platforms by user number in the UK based on industry data produced by GlobalWebIndex (reported by We Are Social, 2020). As Apple iPhone ownership is not universal, this data was collected for a subset (n = 78) of the participants.

Personality traits were measured using the 120-item IPIP-NEO-120 scale provided by Johnson (2014). Participants responded to 120 randomized statements using a Likert scale (*Very inaccurate, moderately inaccurate, neither accurate nor inaccurate, moderately accurate, very accurate*). After reversing scores for negatively worded statements, the 120-items then give scores for 30 'facets' which contribute to the 'Big Five trait' factors (neuroticism, extraversion, openness, agreeableness, and conscientiousness). According to Johnson (2014), the scale has a reported Cronbach's alpha coefficient of α = 0.88 for neuroticism, α = 0.84 for extraversion, α = 0.85 for openness, α = 0.81 for agreeableness, and α = 0.84 for conscientiousness. In the current study, the Cronbach's alpha coefficient was α = 0.92 for neuroticism, α = 0.91 for extraversion, α = 0.79 for openness, α = 0.86 for agreeableness, and α = 0.88 for conscientiousness.

RESULTS

Following the order of our research questions, we firstly considered the overall motives for using social media in a

physically distanced situation. We then looked at variations in the motives for using social media according to personality traits, reporting in particular on where personality predicted particular motives. Lastly, we also present our findings for the platforms used within this overall 'social media use,' according to duration data. **Table 1** provides descriptive statistics of all variables in this study.

Motives for Using Social Media

After combining the 24-items to form the factors identified by Hollenbaugh and Ferris (2014), our results indicated that social media use is mainly driven by the 'Pass Time' motive. However, there was also a strong desire to 'Maintain Relationships'. See **Table 1** for the finding for each motive. In comparison, Ferris and Hollenbaugh (2018) reported the following results for 'Virtual Community' (M = 2.02, SD = 0.92, α = 0.89), 'Companionship' (M = 1.93, SD = 1.07, α = 0.94), 'Exhibitionism' (M = 2.01, SD = 1.00, α = 0.90), 'Relationship Maintenance' (M = 4.18, SD = 0.72, α = 0.87) and 'Passing Time' (M = 4.05, SD = 0.92, $r = 0.66$, $p < 0.001$).

Individual Characteristics and Motives for Using Social Media

In order to assess the relationship between personality traits and motives for the use of social media, scores for the Big Five factors were correlated with scores for each of the five motives (see **Table 2**). The factors identified through the motivation scale were not normally distributed ($p < 0.001$), therefore non-parametric Spearman rho correlations were employed in the analyses that follow. Power estimates were calculated using G*Power 3.1.9.4 software, based on an α error probability of 0.05, and are reported in **Table 2**.

Our findings showed a number of moderate relationships between personality and motives for using social media (see **Table 2**). First, all personality traits except neuroticism were positively related with use of social media to 'Maintain Relationships,' however, these relationships were only significant for those scoring higher for extraversion, those scoring higher for openness, and those scoring higher for conscientiousness. In contrast, a small positive correlation was identified between neuroticism and all factors except 'Relationship Maintenance.' These positive correlations were significant for all relationships except between neuroticism and 'Virtual Community.' Among the many variations between traits, these findings showed particularly clear differences in the motives of individuals scoring higher for neuroticism and individuals scoring higher in conscientiousness with correlations in opposite directions: neuroticism related positively to 'Companionship,' 'Exhibitionism,' and 'Passing Time,' whereas conscientiousness related negatively to the same motives.

Other findings included small but significant negative correlations between conscientiousness and all factors except 'Relationship Maintenance' (for which a positive correlation was found), small but significant positive correlations between openness and both 'Relationship Maintenance' and 'Passing Time,' and a small negative correlation between agreeableness and 'Exhibitionism.' No significant relationships were identified between other traits and motives.

As shown in **Table 2**, age was also significantly negatively correlated with all motives except 'Relationship Maintenance' (for which no relationship was found), showing that these are more likely to be recognized as motives by younger participants. To investigate differences between age groups, we split our sample into four groups according to the generation they belonged to (according to Pew Research Center, 2019), from Baby Boomers to Generation Z. This data is displayed in **Tables 3**, **4**. The Wilks' Lambda value for the differences between generations was 0.697 with a significance value of <0.001. Mean generational differences in the motives for social media use were found to be significant for the 'Companionship' and 'Passing Time' motives, although allowing for a Bonferroni adjustment only the generational differences for the 'Passing Time' motive was significant.

Five hierarchical multiple regressions were then conducted to determine whether personality traits significantly predicted each of the five motives for social media use, controlling for age and gender (see **Table 5**). Age and gender were first added to the model, followed by all five-factor personality traits. Firstly, our findings showed that age was a significant negative predictor of the motives to use social media for 'Companionship,' 'Exhibitionism,' and 'Passing Time.' As age increases, these motives decreased. Gender was also found to be a predictor of two motives; females were more likely than males to identify 'Relationship Maintenance' and 'Passing Time' as motives for social media use.

Our findings then showed that models including personality traits improved the explanation of variance for all motives. The R^2 value change for each model demonstrated that five-factor personality traits increased the explanation of variance beyond age and gender alone. The overall explanation of variance was strongest for the prediction of 'Passing Time' as a motive, although the F change indicated that the change following the addition of personality traits was not statistically significant. The explanation of variance was weakest for the prediction of 'Virtual Community' as a motive. None of the models explained more than 28 per cent of the variance, signaling that other variables explained the majority of the variance in these models.

The improvement in the R^2 value was greatest for the 'Exhibitionism' motive, indicating that five-factor personality traits contribute more to this model than other motives. Yet only a few individual personality traits contributed significantly to these models. These included extraversion predicting 'Relationship Maintenance,' and neuroticism predicting 'Exhibitionism,' both supporting the relationships previously identified through correlations. Other findings included extraversion predicting 'Exhibitionism,' agreeableness negatively predicting 'Exhibitionism,' and conscientiousness negatively predicting 'Virtual Community.' No significant predictive relationships were identified between other traits and motives.

Duration of Social Media Use

Because duration data were only available from participants owning Apple iPhones, we were able to collect duration data from

TABLE 1 | Means, standard deviations, skewness and kurtosis for all study variables.

	N	Minimum	Maximum	Mean	*SD*	Skewness		Kurtosis	
						Statistic	*SE*	Statistic	*SE*
Age	189	18	75	36.33	13.61	0.83	0.177	−0.07	0.35
Neuroticism	189	29	119	73.82	17.53	−0.09	0.177	−0.18	0.35
Extraversion	189	26	108	70.78	15.55	−0.24	0.177	0.01	0.35
Openness	189	47	112	79.90	11.18	0.06	0.177	−0.26	0.35
Agreeableness	189	55	118	90.66	11.89	−0.30	0.177	−0.29	0.35
Conscientiousness	189	49	117	84.88	13.42	−0.18	0.177	−0.29	0.35
Social media motives									
Virtual community	189	1.00	4.67	1.91	0.87	1.00	0.177	0.52	0.35
Companionship	189	1.00	5.00	2.53	1.10	0.18	0.177	−1.02	0.35
Exhibitionism	189	1.00	3.80	1.72	0.74	0.89	0.177	−0.19	0.35
Relationship maintenance	189	1.00	5.00	3.76	0.81	−1.18	0.177	1.90	0.35
Passing time	189	1.00	5.00	3.89	1.00	−1.17	0.177	1.08	0.35

TABLE 2 | Correlating motives with age and Big Five trait scores.

		Virtual community	Companionship	Exhibitionism	Relationship maintenance	Passing time
Neuroticism	Correlation Coefficient	0.14	0.29**	0.21**	–0.04	0.223**
	Sig. (two-tailed)	0.05	0.00	0.004	0.61	0.002
	Power	0.49	0.98	0.83	0.08	0.87
	N	189	189	189	189	189
Extraversion	Correlation coefficient	–0.04	–0.13	0.10	0.20**	0.02
	Sig. (two-tailed)	0.58	0.080	0.17	0.01	0.78
	Power	–0.04	0.43	0.28	0.79	0.06
	N	189	189	189	189	189
Openness	Correlation coefficient	–0.02	0.09	0.09	0.18*	0.24**
	Sig. (two-tailed)	0.77	0.23	0.21	0.01	0.001
	Power	0.06	0.23	0.23	0.70	0.92
	N	189	189	189	189	189
Agreeableness	Correlation coefficient	–0.14	–0.05	–0.27**	0.13	0.002
	Sig. (two-tailed)	0.05	0.52	0.00	0.08	0.98
	Power	0.49	0.10	0.97	0.43	0.05
	N	189	189	189	189	189
Conscientiousness	Correlation coefficient	–0.24**	–0.25**	–0.24**	0.15*	–0.19*
	Sig. (two-tailed)	0.001	0.001	0.001	0.04	0.008
	Power	0.92	0.94	0.92	0.54	0.75
	N	189	189	189	189	189
Age	Correlation coefficient	–0.18*	–0.29**	–0.20**	0.07	–0.39**
	Sig. (two-tailed)	0.016	0.00	0.01	0.36	0.00
	Power	0.70	0.98	0.79	0.15	0.99
	N	189	189	189	189	189

***Correlation is significant at the 0.01 level (two-tailed). *Correlation is significant at the 0.05 level (two-tailed).*

a subset (n = 78) of the total participants (n = 189). However, this data indicated the most heavily used social media. **Figure 1** displays the time that participants spent using each platform on their iPhones in minutes per week. Our full findings (**Table 6**) demonstrated that Facebook is the most heavily used platform, with users spending approximately 3 h per week on Facebook on average. Instagram was the second most-used platform, although participants spent almost an hour less on Instagram per week. In comparison, participants spent just 9 min on each of LinkedIn and Tumblr (M = 5.86 min).

Motives, age, and five-factor personality traits were also correlated with the duration data for each platform using Spearman rho correlations. Our results (see **Table 7**) showed statistical significance for the correlations between both the 'Companionship' and 'Passing Time' motives and the duration of Instagram and Snapchat use. A correlation was also identified between the 'Passing Time' motive and duration of Twitter use. The 'Relationship Maintenance' motive correlated with the duration of use of Facebook. Neuroticism correlated significantly and positively with Instagram, Twitter and Reddit;

TABLE 3 | Descriptive statistics for generational motives.

	Generation	Mean	Standard deviation	*N*
Virtual community	Silent (75–92)	1.25	0.35	2
	Boomers (56–74)	1.91	0.89	20
	Generation X (40–55)	1.85	0.92	38
	Millennials (24–39)	1.85	0.80	101
	Generation Z (8–23)	2.26	0.99	28
	Total	1.91	0.87	189
Companionship	Silent (75–92)	2.00	1.41	2
	Boomers (56–74)	2.19	1.12	20
	Generation X (40–55)	2.19	1.13	38
	Millennials (24–39)	2.60	1.08	101
	Generation Z (8–23)	3.04	0.92	28
	Total	2.54	1.10	189
Exhibitionism	Silent (75–92)	1.00	0.00	2
	Boomers (56–74)	1.58	0.68	20
	Generation X (40–55)	1.62	0.76	38
	Millennials (24–39)	1.76	0.75	101
	Generation Z (8–23)	1.84	0.75	28
	Total	1.72	0.74	189
Relationship maintenance	Silent (75–92)	3.60	0.28	2
	Boomers (56–74)	3.65	1.01	20
	Generation X (40–55)	3.84	0.91	38
	Millennials (24–39)	3.75	0.75	101
	Generation Z (8–23)	3.79	0.75	28
	Total	3.76	0.81	189
Passing time	Silent (75–92)	3.00	1.41	2
	Boomers (56–74)	2.80	1.24	20
	Generation X (40–55)	3.49	1.05	38
	Millennials (24–39)	4.20	0.79	101
	Generation Z (8–23)	4.20	0.70	28
	Total	3.89	1.01	189

TABLE 4 | Tests of between-subjects effects for generational motives.

Dependent variable	Type III sum of squares	df	Mean square	*F*	Sig.	Partial eta squared
Virtual community	4.78	4	1.20	1.61	0.17	0.03
Companionship	15.05	4	3.76	3.24	0.01	0.07
Exhibitionism	2.43	4	0.61	1.10	0.36	0.02
Relationship maintenance	0.54	4	0.14	0.20	0.94	0.004
Passing time	43.73	4	10.93	13.62	0.00	0.23

yet extraversion correlated negatively with Reddit. Age correlated negatively and significantly with Instagram, Twitter and Snapchat, showing that duration of use for these platforms was higher among those who were younger. Again, we split our sample into generational groups; however, the Wilks' Lambda value for the differences between generations was 0.578 with a significance value of 0.142, indicating that these differences were not significant.

DISCUSSION

This exploratory study has identified a number of findings about social media use in situations requiring physical distancing, including individuals' most prominent motives for using social media, and the differences in motives for social media use according to personality traits. The previous study to use this scale (Ferris and Hollenbaugh, 2018) assessed motives when participants were not living under physically distanced conditions. As with this previous study, 'Passing Time' and 'Relationship Maintenance' remain the main motives of social media use. However, the comparison of the mean score in our study for the 'Companionship' motive and the mean score for the same motive in the study undertaken by Ferris and Hollenbaugh (2018) indicates that 'Companionship' is now a stronger motive than previously identified. This investigation therefore highlights a difference for this motive in a situation where the importance of social media for social interaction with

TABLE 5 | Regressing motives on individual characteristics.

Predictors	Virtual community			Companionship			Exhibitionism			Relationship maintenance			Passing time		
Step 1	β	*t*	Sig.	β	*t*	Sig.	β	*t*	Sig.	β	*t*	Sig.	β	*t*	Sig.
Age	−0.14	−1.90	0.06	−0.25**	−3.47	0.001	−0.20**	−2.70	0.01	0.04	0.53	0.60	−0.43***	−6.68	0.00
Gender	0.004	0.05	0.96	0.06	0.78	0.44	−0.01	−0.18	0.86	0.23**	3.22	0.002	0.18**	2.82	0.01
R^2	0.02			0.07			0.04			0.05			0.25		
F	1.89			7.09***			3.71*			5.19**			31.08***		
Step 2															
Age	−0.05	−0.64	0.52	−0.16*	−2.09	0.04	−0.05	−0.68	0.50	0.07	0.91	0.36	−0.36***	−5.10	0.00
Gender	0.55	0.70	0.49	0.04	0.55	0.59	−0.03	−0.34	0.73	0.15	1.90	0.06	0.16*	2.25	0.03
Neuroticism	0.03	0.25	0.81	0.19	1.71	0.09	0.29**	2.68	0.01	0.20	1.76	0.08	0.13	1.25	0.22
Extraversion	0.10	1.02	0.31	−0.001	−0.01	0.99	0.30**	3.19	0.002	0.21*	2.12	0.04	0.05	0.60	0.55
Openness	−0.03	−0.37	0.71	0.06	0.75	0.45	0.03	0.40	0.69	0.11	1.44	0.15	0.12	1.77	0.08
Agreeableness	−0.09	−1.16	0.25	0.01	0.14	0.89	−0.16*	−2.11	0.04	0.04	0.53	0.60	0.01	0.15	0.88
Conscientiousness	−0.24*	−2.52	0.01	−0.09	−0.91	0.36	−0.09	−0.97	0.33	0.14	1.44	0.15	−0.06	−0.70	0.48
R^2	0.09			0.13			0.17			0.11			0.28		
R^2 change	0.07			0.06			0.13			0.05			0.03		
F change	2.75*			2.38*			5.47***			2.13			1.64		

*All betas are standardized betas. N = 189. ***Correlation is significant at the 0.001 level. **Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.*

FIGURE 1 | Time spent using each platform per week.

'companions' is amplified by an absence of physical 'face-to-face' interaction.

It is also important to acknowledge the effect of both age and gender on the motives for using social media. Similar to Ferris and Hollenbaugh (2018) findings, age is a highly statistically significant negative predictor of the 'Passing Time' motive. However, in our study, age was also a statistically significant negative predictor of the 'Companionship' motive. Also, unlike Ferris and Hollenbaugh's (2018) findings, female participants were more likely to identify the 'Passing Time' motive. Due to the effects of age and gender therefore, these were controlled for when investigating the relationships between personality traits and motivation as discussed below.

Personality and Motivation to Use Social Media

Although descriptive statistics reveal trends in the reasons for social media use, a deeper research objective was to understand how individual characteristics affect these motives. Our findings indicate that under physical distancing conditions, motives for social media use vary according to personality traits, suggesting that social media does not serve individuals' needs in a uniform way. Personality traits also help to predict the 'Virtual Community' motive, 'Companionship' motive, and 'Exhibitionism' motive, although the overall contribution of personality traits to each model is modest.

However, an examination of the contribution made by specific traits reveals some notable differences in the relationships between specific traits and each motive. Similar studies in non-pandemic environments (Hollenbaugh and Ferris, 2014; Ferris and Hollenbaugh, 2018) provide an important benchmark for comparison, against which our findings indicate some clear changes. For example, surprisingly, Ferris and Hollenbaugh (2018) identified no statistically significant effect of extraversion on any motives to use social media. Yet our study found a small but statistically significant positive effect on the 'Exhibitionism' and 'Relationship Maintenance'

TABLE 6 | Descriptive statistics for duration of social media use.

	N	Range	Minimum	Maximum	Mean	Standard deviation
YouTube (mins)	78	1225.00	0.00	1225.00	119.24	225.81
Facebook (mins)	78	2591.00	0.00	2591.00	181.74	340.30
Instagram (mins)	78	1024.00	0.00	1024.00	125.49	185.75
Twitter (mins)	78	441.00	0.00	441.00	52.08	103.83
LinkedIn (mins)	78	248.00	0.00	248.00	9.82	32.61
Pinterest (mins)	78	304.00	0.00	304.00	16.23	48.78
Snapchat (mins)	78	600.00	0.00	600.00	40.92	105.32
Reddit (mins)	78	1488.00	0.00	1488.00	42.06	187.00
Twitch (mins)	78	303.00	0.00	303.00	10.46	42.23
Tumblr (mins)	78	180.00	0.00	180.00	9.68	31.53

motives. Our study therefore suggests that in conditions of enforced physical distancing, those scoring higher for extraversion are more motivated to use social media for 'Exhibitionism' and 'Relationship Maintenance.' Importantly, in the context of this scale, 'Relationship Maintenance' refers to the process of interacting with existing friends, rather than building a new 'Virtual Community' or seeking 'Companionship' to prevent loneliness (Hollenbaugh and Ferris, 2014). In a physically distanced situation, the finding that those scoring highly for extraversion now use social media for 'Relationship Maintenance' suggests that social media use may replace 'face-to-face' interaction with these existing friends. These findings also reflect offline studies that have previously related extraversion to being 'gregarious' (Costa and McCrae, 1992) and sociable (Argyle and Lu, 1990; Eysenck et al., 1992; Olson and Weber, 2004), regularly conversing with others (Mehl et al., 2006) and engaging in non-verbal communication (Akert and Panter, 1988).

Although not previously identified as a specific motive (Ferris and Hollenbaugh, 2018), some aspects of online relationship-maintaining behavior have previously been related to extraversion. Gregarious and sociable tendencies have previously been revealed on social media via indicators such as high friend quantity (see Amichai-Hamburger and Vinitzky, 2010; Gosling et al., 2011; Ong et al., 2011) and interaction within groups (Bachrach et al., 2012; Kelsen and Flowers, 2018). Furthermore, studies have previously identified a desire to 'connect' on social media (Bhattacharya et al., 2014; Orchard et al., 2014). However, our novel findings suggest that under social distancing conditions this social online behavior is now an explicit reason for social media use.

In their recent study, Ferris and Hollenbaugh (2018), identified that neuroticism had a small but significant positive effect on the 'Companionship' motive. Although our findings reveal a relationship in the same direction, it is not statistically significant. Furthermore, we find a small statistically significant effect for neuroticism on the 'Exhibitionism' motive. This is a surprising finding, given that those with high trait neuroticism are typically socially uneasy (de Jong et al., 1999; Tong et al., 2004; Dehle and Landers, 2005; Suurmeijer et al., 2005). The contrast with the finding within the previous study (Ferris and Hollenbaugh, 2018) therefore suggests that 'Exhibitionism' is specifically a motive under physically distanced conditions. Some of this apparent intention to self-promote might be explained by the self-consciousness facet contributing to neuroticism (Costa and McCrae, 1992) within the five-factor model. Previous studies have also revealed a positive relationship with use of social networks for self-promotion (Roulin, 2014), and 'commenting' as a form of 'exhibitionism' (Wu and Atkin, 2017). Our finding suggests that these may become more prominent motives under physically distanced conditions.

The previous study (Ferris and Hollenbaugh, 2018) reported that openness had a small but significant positive effect on the 'Companionship,' 'Exhibitionism,' and 'Relationship Maintenance' motives. Although we find similar effects, none of these was statistically significant. Although the lack of a significant relationship might initially appear to contradict the relationship between openness and use of social media to connect with like-minded people (Bhattacharya et al., 2014), prior research into social media use among those high in openness is contradictory anyway. While some studies indicate that those who use social media are likely to score higher for openness (Özgüven and Mucan, 2013; Buettner, 2016; Taber and Whittaker, 2018), others have found a negative correlation between social media use and openness (Annisette and Lafreniere, 2017). Therefore, drivers of social media use are one aspect of the relationship between social media and openness requiring further attention in order to understand these inconsistencies.

Ferris and Hollenbaugh (2018) reported that agreeableness had a small but significant positive effect on the 'Virtual Community' motive and small but significant negative effect on the 'Exhibitionism' motive. Although not statistically significant, our study now finds a negative relationship with the 'Virtual Community' motive. This is a surprising finding requiring further investigation, especially since other studies have shown that agreeableness does relate to use of social media for social interaction (Eşkisu et al., 2017), and that people higher in agreeableness are driven by the potential for social benefit (Marino et al., 2016). However, reflecting the previous study (Ferris and Hollenbaugh, 2018), we also find a small but significant negative effect on the 'Exhibitionism' motive. This again reflects the 'modesty' of agreeable people (Costa and

TABLE 7 | Correlating duration of use, with motives, personality traits, and age.

	YouTube (mins)	Facebook (mins)	Instagram (mins)	Twitter (mins)	LinkedIn (mins)	Pinterest (mins)	Snapchat (mins)	Reddit (mins)	Twitch (mins)	Tumblr (mins)
Virtual community	0.12	−0.02	0.22	0.12	0.05	0.10	0.09	0.14	0.12	0.09
Companionship	0.04	0.14	0.26*	0.16	−0.02	0.07	0.27*	0.12	0.03	0.02
Exhibitionism	0.06	0.06	0.18	−0.08	−0.05	−0.001	0.12	−0.06	−0.05	−0.03
Relationship maintenance	0.07	0.28*	−0.03	0.03	0.03	0.12	0.11	−0.10	−0.01	0.01
Passing time	−0.05	0.05	0.33**	0.23**	−0.09	0.02	0.25*	0.06	0.03	−0.02
Neuroticism	0.17	0.09	0.28*	0.30*	0.01	0.02	0.19	0.25*	0.14	0.20
Extraversion	−0.10	0.06	−0.06	−0.22	−0.03	0.05	0.13	−0.26*	−0.13	−0.18
Openness	−0.13	−0.01	0.13	0.03	−0.03	0.09	−0.16	−0.01	−0.09	−0.02
Agreeableness	−0.003	0.15	−0.01	−0.01	0.05	0.12	−0.15	−0.17	−0.09	−0.10
Conscientiousness	−0.14	−0.01	−0.18	−0.15	0.07	0.14	0.03	−0.17	0.08	0.04
Age	−0.13	0.07	−0.38**	−0.32**	0.05	0.03	−0.48**	−0.001	−0.09	−0.07

**Correlation is significant at the 0.01 level (two-tailed). *Correlation is significant at the 0.05 level (two-tailed).

McCrae, 1995) who consistently feel uncomfortable 'showing off', as reflected previously in the negative relationship with self-status seeking on social media (Lin et al., 2017).

In Ferris and Hollenbaugh's (2018) study, conscientiousness had a small but significant negative effect on the 'Virtual Community,' 'Companionship,' and 'Exhibitionism' motives. We also find small negative relationships for each of these motives, although only the effect on the 'Virtual Community' motive is statistically significant. These results indicate that conscientious people, who are known to be 'self-disciplined' (Costa and McCrae, 1995) and focused on the task in hand, do not allow social media use to distract them. Yet, again there is some contradiction between our findings and wider findings that show that a relationship between conscientiousness and the use of social media to connect with peers and new friends (Bhattacharya et al., 2014), use of Facebook for maintaining relationships Horzum (2016), and use of Twitter for 'social purposes' Hughes et al. (2012).

Duration of Social Media Use and Relationship to Personality Traits

As the world's most popular platform according to membership (Statista, 2020), it is perhaps unsurprising that the social media platform used for the longest duration is Facebook. Our data also shows that Facebook use is also related to the motive to 'Maintain Relationships.' However, few significant relationships were identified between personality traits and duration of social media use. Of the relationships that were identified, three significant correlations were found between neuroticism and use of Instagram, Twitter, and Reddit. Whilst previous studies have identified positive correlations between neuroticism and duration of social media use, these have previously focused on Facebook (Moore and McElroy, 2012; Kuo and Tang, 2014). In fact, previous studies of Instagram (such as Brailovskaia and Margraf, 2018; Casado-Riera and Carbonell, 2018) and Twitter (such as Petrocchi et al., 2015; Yoong et al., 2017) have not identified a link to neuroticism at all.

Limitations and Future Research Directions

While this study provides an important insight into motivation under physically distanced conditions, our findings are based on a relatively small sample of 189 respondents. This is therefore an exploratory study providing indicative findings and signposting topics for further research. Although significant relationships were identified, there is clearly an opportunity to repeat this research with a wider sample in order to compare results across nations and cultures, as suggested by Henrich et al. (2010). Within a wider sample we also recognize the opportunity to explore the effect of further potential variables such as educational level or employment, neither of which were examined in our study nor the preceding Hollenbaugh and Ferris (2014) study. This sample included a wide range of ages (18–75 years with a large standard deviation), whereas future samples might enable comparison between specific age groups. Our study also indicated two motives for females specifically. This

requires further investigation. Firstly, there is an opportunity to understand why these motives are particularly found for females. Secondly, further work is required to understand what the motives are for male social media use and why these are different.

Given predictions about new patterns of behavior emerging as the 'lasting digital legacy' of COVID-19 (Ofcom, 2020b), this research suggests wider changes in the motivations for social media use that may be longer-term in a post-pandemic world. Further research could also assess whether the trends found in this specific 'pandemic' situation are replicated in other situations where people are reliant on social media to maintain a relationship such as those whose professions take them physically away from social circles. This might include, for example, those in the military, regular long-distance travelers, or those working in remote locations such as miners. Furthermore, a future replication of the study when the pandemic has ended would provide an important comparison point to identify the extent to which these findings are specific to a pandemic environment. Longitudinal studies might also provide insight on longer-term changes in social media use, both resulting from the constant evolution in social media functionality as well as legacy changes to communication practices following the pandemic.

Our study employed the 120-item IPIP-NEO-120 scale provided by Johnson (2014), whereas the previous study against which we compare our results used the 44-item Big Five Inventory (BFI) scale provided by John et al. (1991), so we acknowledge that each measurement of the big five traits used a slightly different set of questions. Yet, previous comparisons of IPIP and BFI items (such as Donnellan et al., 2006; Zheng et al., 2008; Fossati et al., 2011; Akhtar and Azwar, 2018) have indicated that there is a strong correlation between the measures. We also recognize the subtle difference between our study which investigated motives for 'social media' use in general, and our comparison with a previous study which focused on motives for one specific social media platform, Facebook. Our duration data did demonstrate that Facebook was the most-used platform, indicating that despite the question referring to 'social media,' participants were likely to be the describing motives for Facebook use. Nevertheless, a future study might more clearly compare motives for 'social media' between physically distanced and non-physically distanced situations. This might involve comparison of two samples, or one sample during and post-pandemic, using a *t*-test. Comparison of samples was not possible in the current study as the previous data was not available. There is also an opportunity to apply the same measures across each of the commonly used social media platforms in turn to study nuances in the motives associated with each. For example, is the motivation to use a messaging platform designed specifically to engage the user in 'active' use different to that of a video platform primarily intended to broadcast to a largely 'passive' audience?

Lastly, there is a limitation with our duration data as we were only able to collect this from Apple iPhone users. We acknowledge that this data therefore does not represent the full sample, plus we recognize the possibility that the characteristics of Apple iPhone users may affect their usage of social media. Therefore, a consistent methodology is required to collect accurate social media duration data from users of all technologies, including those who access social media using computers.

In conclusion therefore, based on a novel situation, this study has identified compelling data about the motives to use social media, how these relate to individual characteristics such as personality traits, and how the data compares to similar pre-pandemic data. However, through further research this could lead to a fuller and more accurate picture about the conditions that might lead to similar findings. Given the doubts raised about when or even whether society will ever return to the same frequency of physical interaction, this is an intriguing and potentially important area for future exploration.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the University of Bath. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

TB-G undertook the research and wrote the manuscript, with supervision, review, and editing by JH and AJ. All authors contributed to the article and approved the submitted version.

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Alone Together: Computer-Mediated Communication in Leisure Time During and After the COVID-19 Pandemic

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In spring 2020, the COVID-19 outbreak was declared a global pandemic and several lockdowns were followed in Germany. To weaken the spread of the virus, SARS-CoV-2, people were required to reduce their face-to-face contact with others. Computer-mediated communication (CMC) offers opportunities to stay in touch with important people and still meets social needs. During the first lockdown in spring 2020, we collected data from 679 participants to explore the role of CMC for social interaction in the context of leisure activities and how personal characteristics contribute to such media use. Results showed that people complied with the restriction and shifted their communication to several media, especially instant messengers and video calls. Many leisure activities were performed *via* CMC, especially low-key activities, such as just talking or simply spending time together. Perceived social closeness to others was positively related to the quality and quantity of CMC. The extent of leisure activities that people experienced with others *via* communication media was higher among younger individuals, males, and individuals with higher scores on positive state affect, extraversion, openness, and fear of missing out. The preference for solitude showed a negative relation. The motivation to continue using media for communication after the pandemic was strongly related to the quality and quantity of actual use. Low extraversion and high openness were related to higher motivation for future use. Implications such as the importance of providing fast internet and good usability of communication media as well as the relevance of increasing media literacy of people are discussed.

Keywords: COVID-19, uses and gratification approach, computer-mediated communication, leisure activities, personality, big five, inter-individual differences, perceived social closeness

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INTRODUCTION

In March 2020, the WHO has declared the outbreak of COVID-19 a global pandemic (Cucinotta and Vanelli, 2020). A few weeks later (March 22, 2020), a nationwide lockdown in Germany resulted, including several restrictions that aimed at reducing the spread of the virus. One crucial restriction was the reduction of contacts with other people outside the own

household to an absolute minimum (Bundesregierung, 2020). Furthermore, restaurants were closed, celebrations and sports in groups were forbidden. All these restrictions had an enormous impact on individual freedom and the possibilities for leisure activities. In western societies, the perceived freedom is generally understood as the most important criterion for leisure experiences (Neulinger, 1974), and, hence, these restrictions presumably had a strong impact on leisure behavior that is based on interpersonal interaction. Interpersonal relationships are considered one of the most important aspects of human life (Argyle and Crossland, 1987), and spending time with others is a universal and basic need (Baumeister and Leary, 1995). Accordingly, people usually spend most of their time with others, and time spent alone is generally considered less pleasant than time spent with others (Larson et al., 1982). The current contact restrictions generally threaten the satisfaction of the need for social contacts. Therefore, alternative media-based ways of staying in contact are required.

According to the uses and gratification approach (U&G), people can satisfy some of their basic needs by using media. Although U&G is not a homogeneous theory (Rubin, 2009), different models of varying complexity share the assumption that recipients have several social and psychological needs that elicit specific expectations of how a medium can satisfy these needs. Research revealed that, in addition to the need for information, personal identity, and entertainment, the need for social interaction and integration is a central motive for media use (McQuail, 1994). Overall, the U&G is a useful theoretical framework emphasizing the active role of the individual user regarding media selection and consumption strategies to actively link need gratification with media choice and use (Katz et al., 1973). In this way, people may try to satisfy their need for social interaction and integration during contact restrictions by using computer-mediated communication (CMC). To investigate this critical aspect, the present study was conducted during the first nationwide lockdown in Germany in spring 2020. Based on the U&G approach, we pursued two objectives: On the one hand, we aimed to explore what communication media people use more frequently in the context of leisure activities during the first nationwide lockdown than before the pandemic, which specific leisure activities they conduct with others *via* CMC, and to what extent the perceived quality and quantity of CMC actually correlates with its primary goal of satisfying the need for social interaction and integration. On the other hand, recent U&G research has intensified the examination of inter-individual differences in media use. Tosun and Lajunen (2010) have already stated that people with different personal characteristics can differ in the needs they seek to satisfy *via* media use. Indeed, several studies in the field of U&G research showed that a wide range of individual characteristics of media users, such as age, gender, personality traits, and experienced affect, have a significant relationship with media use (e.g., Malik et al., 2016; Kaspar and Müller-Jensen, 2019; Kircaburun et al., 2020; Kaspar and Fuchs, 2021). Therefore, we also explored the role of personal characteristics in the context of leisure activities *via* CMC during the lockdown.

Computer-Mediated Communication in Leisure Time During Contact Restrictions

To avoid losing contact with other people and to fulfill social needs, the digital world opens new possibilities to keep in touch with friends and family members (Saltzman et al., 2020). Without being in the same room and risking infection with SARS-CoV-2, the virus that causes COVID-19, CMC provides a safe way to spend time together with others. In fact, CMC was found to have a positive impact on well-being of people during contact restrictions (Nimrod, 2020), and spending time with family *via* media was associated with less depression (Ellis et al., 2020). Furthermore, parents reported that they and their children have increased their use of technology and social media since the contact restrictions (Drouin et al., 2020). These findings indicate that social interactions during the pandemic has shifted to the digital world. Hence, we formulated the following research question:

> RQ1: What communication media are being used more frequently in the context of leisure activities during the first nationwide lockdown than before the pandemic?

Contact restrictions force people to try new ways to stay in touch with their family and friends and spend their leisure time together. For example, Perks (2020) found that the number of people playing online games has increased since COVID-19. In general, media is particularly useful for reinventing leisure activities (Meisner, 2020). Active and creative media users could transfer and adapt leisure activities to the digital world. Thus, we explored the following research question:

> RQ2: What leisure activities do people experience with others *via* CMC during the lockdown?

In addition to the questions of which media were used and which activities were shifted to the digital world during the first lockdown, the question of satisfying the need for social contact and relationships remains. A central aspect of the need for social interaction and integration is social closeness (Aron et al., 2004). Perceived social closeness is not static but changes depending on the situation (Lee and Gillath, 2016). Consequently, the perceived social closeness with other people is likely to suffer greatly from contact restrictions. In this way, perceived social closeness in the context of CMC is an appropriate indicator of whether media use actually satisfies the social need for interaction and integration. According to the U&G approach, the gratification sought does not always correspond to the gratification received. Only if media use fulfills the expected gratification, it is likely that people will turn to this medium again if they have the same need (Palmgreen and Rayburn, 1982). The chosen media should, therefore, meet the expectations of social interaction and integration. In this context, Hecht (1978) defined communication satisfaction as one of the most important positive reinforcements, which is associated with the fulfillment of positive communicative expectations. In the present study, perceived satisfaction, thus, served as a quality indicator of CMC. In addition to perceived quality,

communication intensity (i.e., quantity) may also be important. The more intensively media are used for communication purposes, the more likely respective needs will be sufficiently gratified at the end. However, we may assume that the intensity of CMC is associated with perceived satisfaction, because disappointing communication may lower motivation of one to use media intensively. Therefore, we explored the following research question during the lockdown:

> RQ3: What is the relationship between the perceived quality of CMC in the context of leisure activities and the perceived social closeness to others, and is this relationship moderated by the quantity of CMC?

Inter-Individual Differences in Media Use for Leisure Activities During Contact Restrictions

In the context of the U&G approach, the influential role of inter-individual differences in media user characteristics have been emphasized, including age, gender, affect, and diverse personality traits (e.g., Malik et al., 2016; Kaspar and Müller-Jensen, 2019; Kircaburun et al., 2020; Kaspar and Fuchs, 2021). However, research that examined the relationship between personal characteristics and media use during the current pandemic is sparse. Consequently, the present study focused on several personal characteristics that were found to be relevant in the time before the pandemic.

Age and Gender

The age of media users is related to their use of digital media for communication (Ono and Zavodny, 2003; Kimbrough et al., 2013; Özgüven and Mucan, 2013; Blackwell et al., 2017). Czaja et al. (2006) found that younger people adopted new technologies faster than older people did. Additionally, younger people used social media more often for communication purposes than older generations (Blackwell et al., 2017). The care of peer relations is thereby an important need (Kumar and Lim, 2008). In contrast to age, the relationship between gender and media use shows mixed results. Whereas some studies reported no gender differences in the intensity of media use (e.g., Özgüven and Mucan, 2013), other studies found that men used media more frequently and intensively than women did (e.g., Ono and Zavodny, 2003). However, other studies have shown that women, compared to men, preferred and more frequently used text messaging, social media, and online video calls (e.g., Kimbrough et al., 2013). Despite these mixed results, age and gender may play a significant role in CMC during a lockdown situation.

General Self-Efficacy

The COVID-19 pandemic is the fifth pandemic since the 1918 flu (Liu et al., 2020), but the first to affect European society of today. For most people in Germany, this is the first time they had to cope with the consequences of a pandemic. The ability of someone to overcome barriers and find new solutions in an unknown and difficult situation is conceptualized by self-efficacy theory of Bandura (1977). This theory postulates that the initiation and maintenance of behavior are determined by judgments and expectations about behavioral abilities and the likelihood of successfully dealing with the environmental challenges (Bandura, 1977). The theory also postulates that the same factors play an important role in psychological adjustment. Although the construct self-efficacy was originally defined as situation-specific, subsequent theories have described general self-efficacy as a cross-situational trait (Sherer et al., 1982; Shelton, 1990). Sherer et al. (1982) considered general self-efficacy as a personality trait with relative stability that influences the performance of an individual in certain situations, especially when they are novel. General self-efficacy differs in its expression between individuals to consider themselves capable of fulfilling task requirements (Schwarzer and Jerusalem, 1999; Chen et al., 2001). Schwarzer and Jerusalem (1999) assumed that deductive processes take place from general self-efficacy to specific self-efficacy expectations. This was shown by studies in which individuals with higher general self-efficacy exhibited higher computer self-efficacy as well as attributing more technological competencies to themselves (Paraskeva et al., 2008; McCoy, 2010). During the first lockdown, maintaining social contacts and leisure activities presented an unexpected new challenge that had to be overcome, and this challenge goes far beyond the mere application of technology. Hence, general self-efficacy can help to adapt and subsequently change the way leisure time is spent and social needs are met by using CMC. In addition, higher self-efficacy indicates better attitudes toward social media and explains the intention to use (Wang, 2015; Niu et al., 2021).

Positive and Negative State Affect

Another determinant of media use is mood. According to Mood Management Theory of Zillmann (1988), people select media content according to their mood to create or maintain a positive affective state. If people are in a bad mood or feel bored, they could choose entertaining media to lift their mood. Contact restrictions imposed by the government could create a bad mood. Aymerich-Franch (2020) explored this relationship and she showed that negative affect increased during the lockdown, whereas positive affect was lower than before. These changes in affect were significantly associated with an increase in (social) media use. Similarly, people might try to reach a positive mood by using CMC in the context of leisure activities.

Big Five Personality Traits

Inter-individual differences in personality are important when considering motivation and satisfaction in media use (Rubin, 1993). Allport (1961) described personality as a dynamic system that determines the behavior, feelings, and thoughts of an individual. In our study, we considered the personality dimensions of the Big Five (McCrae et al., 1998). The Big Five includes extraversion, agreeableness, conscientiousness, neuroticism, and openness to experiences. These traits show numerous correlations with media use for the gratification of social needs. For example, extraversion and openness were positively associated with the use of social media (Correa et al., 2010). This association was

particularly strong among younger adults. Extroverted people tend to be more loyal to themselves in face-to-face interactions, while neurotic and introverted people found it easier to be themselves in online communication (Amichai-Hamburger et al., 2002). Furthermore, introverts were more likely to dwell on digital communication because they felt less anxious after CMC than after face-to-face interaction (Rice and Markey, 2009). Horzum (2016) found relations between personality traits and differences in motives for social media use. People with a high degree of extraversion used social media for the gratification of meeting new people, socializing as well as informational and educational gratifications. Agreeableness was positively related to gratifications of maintaining existing relationships as well as for informational and educational gratifications. To sum up, previous studies suggest a significant role of the Big Five in CMC during lockdowns in the COVID-19 pandemic.

Fear of Missing Out

Fear of missing out represents the fear that interpersonal interactions might be missed. It is a fear of other people are having fun without themselves, and it has been linked to increased social media use (Przybylski et al., 2013). In fact, Blackwell et al. (2017) found that fear of missing out predicted the use of social media. Also, Wang et al. (2018) suggested that people with higher levels of fear of missing out present themselves online to improve their connection with others. Their findings also showed that people with a high (vs. low) need for social connections are more afraid that their friends might have rewarding experiences without them. Through the increased use of social media, the fear of missing out could increase social connections (Roberts and David, 2020) and hence reduce the perceived social isolation during a pandemic. Consequently, if face-to-face contact with other people is lost due to contact restrictions, this fear could be triggered and may lead to more media use.

Preference for Solitude

Social isolation and loneliness can influence media use to stay in contact with other people. Because humans are understood as social beings, it is assumed that humans have a general need to spend time with other people (Baumeister and Leary, 1995). Perceived loneliness can be understood as a state characterized by a lack of social interaction (e.g., Storr, 1988; Koch, 1994; Burger, 1995). This state can but does not necessarily have to be accompanied by the physical isolation of the person. Nevertheless, people differ in how they react to the lack of social contacts. These differences can be traced back to inter-individual differences in the preference for solitude (e.g., Storr, 1988; Koch, 1994; Burger, 1995). People who prefer solitude like to be alone and spend more evenings alone at home (Nestler et al., 2011). This preference could also be relevant regarding the use of CMC in order (not) to spend time together with other people in their leisure time. For people who prefer being alone, contact restrictions may be changeless in their leisure activities, so they may be less likely to use CMC as a substitute for social needs or to communicate with others, compared with people who do not prefer solitude.

Given the potential relevance of all these personal characteristics for CMC behavior of people in the context of leisure activities during a nationwide lockdown, we asked:

> RQ4: Are personal characteristics of users (age, gender, self-efficacy, state affect, Big Five, fear of missing out, and preference for solitude) related to the number of different leisure activities that people experience with others *via* CMC during the lockdown?

Finally, how people maintain their social contacts during current contact restrictions may have implications for future use of CMC. This is of central importance regarding interaction styles in a post-pandemic era since a pandemic can repeatedly lead to further lockdowns, as happened again in Germany at the end of 2020. According to the U&G approach, it is more likely to choose a medium again, if the medium has already successfully satisfied relevant needs (Palmgreen and Rayburn, 1982). Thus, in addition to personal characteristics, quantity and perceived quality of CMC may be decisive for future use of communication media. We therefore asked the following research question:

> RQ5: Are personal characteristics as well as the quantity and perceived quality of current CMC in the context of leisure activities related to motivation of people to continue CMC after the pandemic?

MATERIALS AND METHODS

Participants

The study included a final data set of 679 full-aged German-speaking participants (558 women, 82.2%) with a mean age of 34.15 years (SD = 12.73, range = 18–69). Eight participants were previously excluded due to incomplete data sets. The most frequently stated educational attainment was a higher educational entrance qualification (n = 210, 30.9%), followed by a degree in master or diploma (n = 155, 22.8%), a completed vocational training (n = 138, 20.3%), a degree in bachelor (n = 112, 16.5%), a secondary school certificate (n = 55, 8.1%), and a main school graduation (n = 9, 1.3%). Participants lived together with an average of 2.08 people (SD = 1.32, range = 0–7). The study ran for 29 days, beginning April 13, 2020, by which time the nationwide lockdown and contact restrictions had already been in effect for 3 weeks.

The participants were recruited through convenience sampling. The link to the study was broadly disseminated *via* mailing lists, social media, and a survey platform of a national journal (Psychologie Heute). Participation in the study was voluntary and no incentives were provided. No identifying data were collected to guarantee anonymity of participants. At the beginning of the study, participants were informed about the purpose of the study, that all data would be processed only for research

purposes, that they would remain anonymous, and that they could prematurely abandon the study at any point in time. The participants finally indicated informed consent by clicking a corresponding box.

Procedure

Participants initially provided their gender, age, the number of people with whom they live together, and their highest educational qualification. Afterward, they were asked several questions about their media use, including contacts with people in leisure time, leisure activities *via* CMC, and quality and quantity of CMC. Then, the participants responded to a series of person-related questions covering self-efficacy, state affect, Big Five personality traits, fear of missing out, and preference for solitude.

Measures

Media Use Variables

Participants reported the number of people they met personally in their leisure time in a normal week before the COVID-19 pandemic and (now) during the nationwide lockdown, excluding people who live in the same household. Then, the participants reported the number of people with whom they have currently contacted *via* CMC in a normal week during the lockdown and their current perceived social closeness to them. Following Lee and Gillath (2016), the latter was measured by a single item "How close do you currently feel to all those people with whom you can currently only communicate *via* media in your leisure time?" (from 1 = "not close at all" to 7 = "very close").

Next, participants were presented with a list of nine communication media: classic letter, SMS/MMS, e-mail, phone call, video call (e.g., Skype or Zoom), instant messenger (e.g., WhatsApp or Telegram), social media sites (e.g., Facebook, Twitter, and Instagram), online forums, and online video games. They indicated with "yes" or "no" to which of the listed media they currently use more frequently in their leisure time to communicate with others than before the pandemic (see **Figure 1**). We chose not to measure the absolute amount of time spent with each medium prior to the pandemic because previous studies have shown that retrospective self-reports of media use are often biased (Collopy, 1996; Araujo et al., 2017). Therefore, we selected a less fine-grained but more reliable measurement.

Then, participants stated ("yes" or "no") to which of 15 activities they currently experience together with other people in their leisure time *via* CMC (e.g., "I use media to learn together with others" or "I use media to cook together with others."). A complete list of all activities is presented in **Figure 2**. A summed value was calculated (from 0 to 15), indicating the number of different leisure activities that people experience with others *via* CMC. This sum value served as a dependent variable in multiple regression analysis in section "Inter-Individual Differences in Media Use for Leisure Activities During Contact Restrictions (RQ4)".

The perceived quality of CMC in the context of leisure activities was assessed by asking "How satisfied are you currently

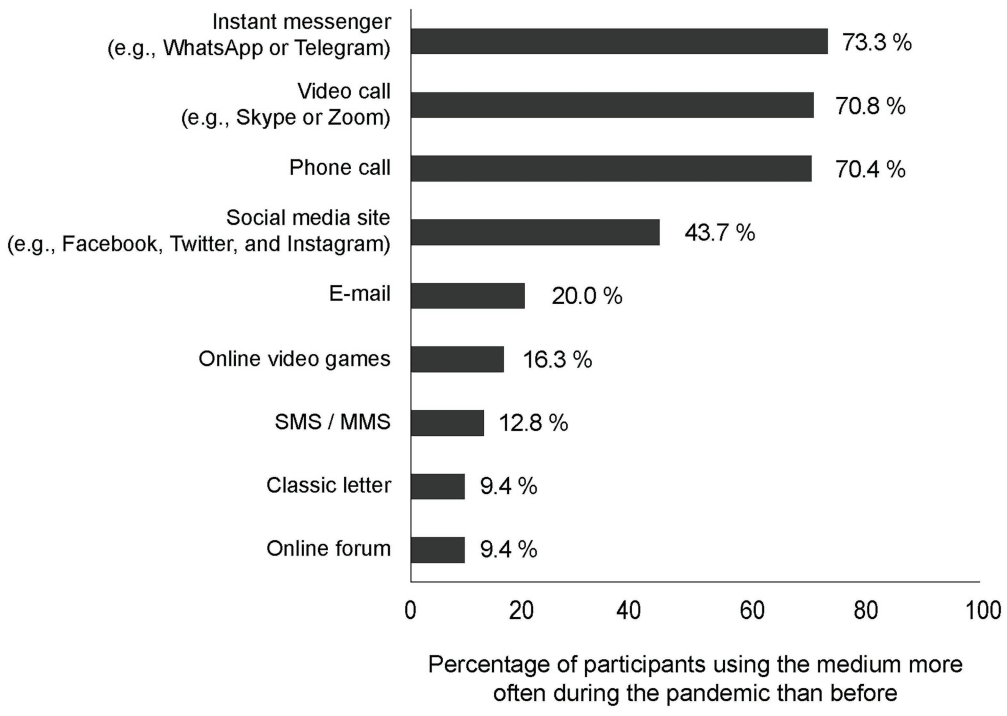

FIGURE 1 | Percentage of participants who reported using communication media more frequently in the context of leisure activities during the first nationwide lockdown than before the pandemic.

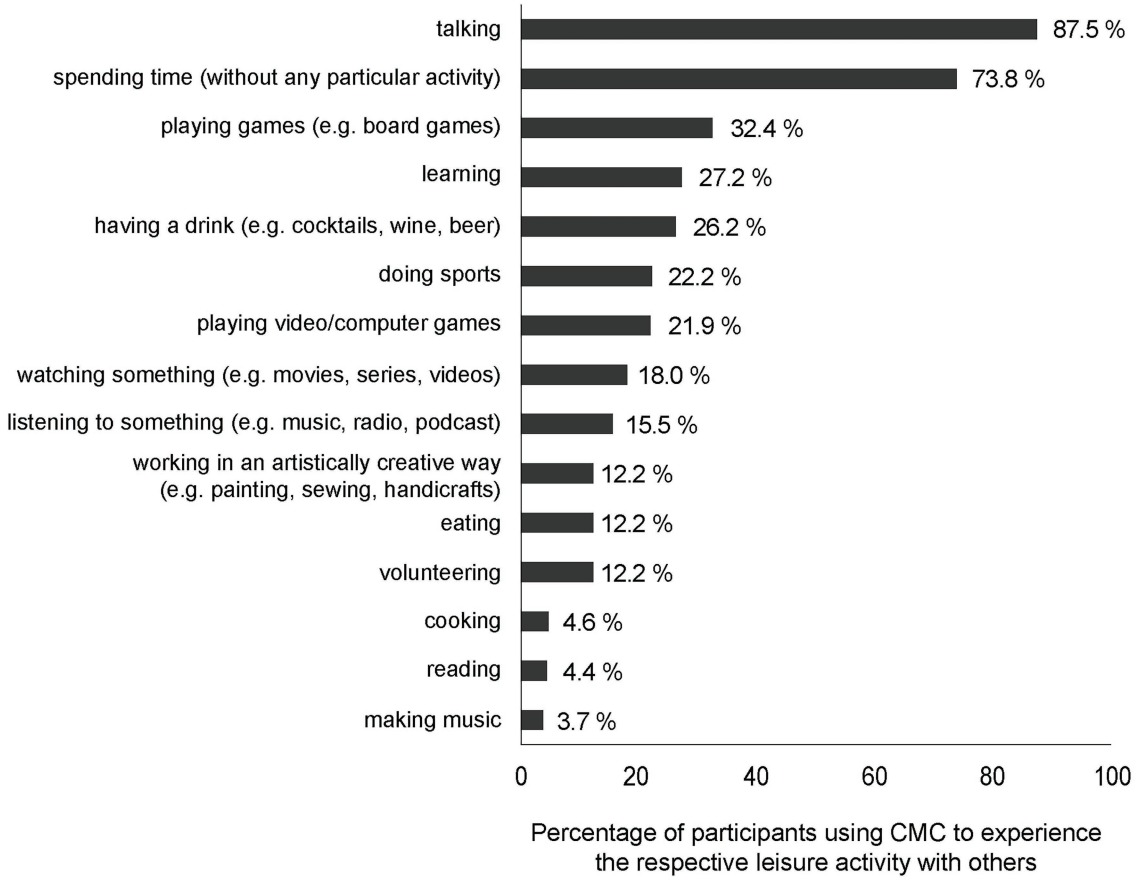

FIGURE 2 | Percentage of participants who reported experiencing certain leisure activities together with others *via* CMC during the first nationwide lockdown.

with the communication you have with other people through media in your leisure time (e.g., smartphone, telephone, PC)?", using a single-item scale ranging from 1 ("not satisfying at all") to 7 ("very satisfying"). To measure the quantity of CMC in the context of leisure activities, participants responded to the question "How intensively do you currently communicate with other people by means of media (e.g., smartphone, telephone, PC) in your leisure time?" (from 1 = "not intensively at all" to 7 = "very intensively"). The quality and quantity of CMC were part of a moderated regression analysis in section "Computer-Mediated Communication in Leisure Time During Contact Restrictions (RQ1, RQ2, and RQ3)". Then, participants rated their motivation to continue CMC with others after the pandemic, even if direct face-to-face contact would be possible again (from 1 = "very little motivated" to 7 = "very strongly motivated"). This variable served as the dependent variable in multiple regression analysis in section "Motivation for Computer-Mediated Communication After Contact Restrictions (RQ5)".

Person-Related Variables

General Self-Efficacy

General self-efficacy was measured by using the short scale of Beierlein et al. (2012), covering three items ("In difficult situations I can rely on my abilities.", "I am able to solve most problems on my own.", "I can usually solve even challenging and complex tasks well.", Cronbach's α = 0.83). The scale uses a five-point format (from 1 = "not true at all" to 5 = "completely true"). According to Schwarzer and Jerusalem (1999), the original 10-item scale has a reliability of α = 0.92, so using the short scale is associated with an acceptable loss of reliability.

Positive and Negative State Affect

The German version of the positive and negative state affect (PANAS; Watson et al., 1988) adapted from Krohne et al. (1996) was used to assess positive (α = 0.85) and negative affect (α = 0.82) of participants experienced in the past few days during the first nationwide lockdown. This scale consists of 20 emotion-laden adjectives (e.g., active, interested, strong, guilty, and nervous) and the possible answers range from 1 to 5 (1 = "not at all", 2 = "a little", 3 = "somewhat", 4 = "considerably", and 5 = "extremely").

Big Five Personality Traits

The BFI-K (Rammstedt and John, 2005) was used to measure extraversion of participants (four items, e.g., "I go out of myself, I am sociable.", α = 0.80), neuroticism (four items, e.g., "I get easily depressed, dejected.", α = 0.79), agreeableness (four items,

e.g., "I easily trust others, believe in the good in people.", $\alpha = 0.64$), conscientiousness (four items, e.g., "I complete tasks thoroughly.", $\alpha = 0.65$) and openness to experiences (five items, e.g., "I am interested in many things.", $\alpha = 0.74$). The answer options are "very incorrect", "rather incorrect", "neither nor", "rather correct" and "very correct". The scale does not include numerical markers.

Fear of Missing Out

Fear of missing out was measured by a scale of Przybylski et al. (2013), which was translated into the German language for the present study (translate-translate back method). Item wording was also guided by a previous German version developed by Spitzer (2015). The scale comprises 10 items (e.g., "I fear others have more rewarding experiences than me." or "I get anxious when I do not know what my friends are up to.", $\alpha = 0.77$). The scale ranges from 1 ("does not apply to me at all") to 5 ("applies extremely well to me"). No verbal markers were presented between the endpoints of the scale.

Preference for Solitude

A German scale measuring preference of one for solitude was used which is composed of 10 items (Nestler et al., 2011). The scale (from 1 = "does not apply at all" to 6 = "very much applies") covers two components, namely the need to be alone and the joy of being alone. These two subscales were aggregated to get the overall preference for solitude ($\alpha = 0.84$).

RESULTS

We ran all analyses with SPSS 27. Before the analyses were calculated, all statistical assumptions were checked. This was particularly relevant for the multiple regression models (cf. Poole and O'Farrell, 1971) to assess the robustness of the results. We did not find outliers, multicollinearity, or autocorrelation in any of the three regression models. Furthermore, linearity and normality were given in all models. However, slight hints for heteroscedasticity were found, so we used bootstrapping method for statistical testing (5,000 iterations).

First, we checked whether the participants complied with the requirements of government to reduce direct face-to-face contact with other people. As expected, participants had less direct face-to-face contact with others ($M = 1.32$, $SD = 2.56$) in their leisure time during the first nationwide lockdown compared to the number of direct contacts they had before the pandemic [($M = 9.17$, $SD = 13.09$), $t(678) = 15.84$, $p < 0.001$, $d = 0.61$]. Hence, the participants had very limited face-to-face contact at the time of the survey.

Computer-Mediated Communication in Leisure Time During Contact Restrictions (RQ1, RQ2, and RQ3)

We analyzed how many participants used the listed media more often for communication purposes during leisure time than before the pandemic (RQ1). As shown in **Figure 1**, especially synchronous media formats were used more frequently. Instant messengers were used more frequently by 73.3% of participants, video calls by 70.8%, and phone calls by 70.4%.

Further, we analyzed which leisure activities people experience with others *via* CMC during the lockdown (RQ2) and as shown in **Figure 2**, participants experienced a wide variety of leisure activities. Most participants used CMC to talk to other people or to simply spend time together without any particular activity. The least common use of CMC was to listen to music, to read, and to cook together with others. On average, participants used CMC for 3.74 ($SD = 2.09$) of the 15 listed activities in their leisure time. The number of different leisure activities that participants experienced with others *via* CMC was further scrutinized in RQ4 in section "Inter-Individual Differences in Media Use for Leisure Activities During Contact Restrictions (RQ4)".

In the next step, a moderated regression (bootstrapping with 5,000 iterations) was calculated. We investigated the relationship between the perceived quality of CMC in the context of leisure activities and the perceived social closeness with other people, and whether this relationship was moderated by the quantity of CMC in the context of leisure activities (RQ3). To avoid problems of multicollinearity, the independent and moderator variables were initially centered and then included in the model together with their interaction term. Perceived social closeness served as the dependent variable. The regression model was significant, $F(3, 675) = 64.02$, $p < 0.001$, with an R^2 of 0.22. Both the perceived quality ($\beta = 0.438$, $p < 0.001$) and the quantity ($\beta = 0.118$, $p = 0.006$) of CMC showed a significant relation to perceived social closeness to other people. However, the interaction term was not significant ($\beta = -0.008$, $p = 0.855$). Hence, the perceived quality of CMC and perceived social closeness to others were positively related, whereas the quantity of CMC did not moderate this relationship but showed itself a significant relation to perceived social closeness.

Inter-Individual Differences in Media Use for Leisure Activities During Contact Restrictions (RQ4)

A multiple regression analysis was run to investigate the relationship between personal characteristics of users and the number of different leisure activities they experience with others *via* CMC during the lockdown (RQ4). Two participants (0.3%) reported their gender as "diverse" and were excluded from the following analyses as this was an insufficient subsample for the corresponding statistical analysis. In summary, the correlations between the independent variables were rather low with few exceptions, as shown in **Table 1**. The highest (positive) correlation was between neuroticism and negative affect ($r = 0.51$). The reported quantity and perceived quality of CMC showed only a few weak correlations with personal characteristics.

Table 2 shows the results of the multiple regression analysis. The number of different leisure activities experienced with

TABLE 1 | Descriptive statistics and bivariate correlations (Pearson *r* and two-tailed *p*-value) among all variables included in regression models.

		M	*SD*	Correlations														
				1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**	**13.**	**14.**	**15.**	**16.**
1.	Age	34.16	12.75																
2.	Gender	–	–	0.01															
3.	Self-efficacy	4.07	0.66	0.10*	−0.00														
4.	Positive affect	2.79	0.69	0.04	−0.02	0.43***													
5.	Negative affect	1.94	0.63	−0.04	0.08*	−0.32***	−0.34***												
6.	Extraversion	3.51	0.88	0.06	0.15***	0.22***	0.21***	−0.01											
7.	Neuroticism	2.91	0.94	−0.15***	0.14***	−0.46***	−0.39***	0.51***	−0.24***										
8.	Agreeableness	3.08	0.81	0.13**	0.07	0.08*	0.15***	−0.13**	0.20***	−0.21***									
9.	Conscientiousness	3.67	0.66	0.10**	0.18***	0.40***	0.33***	−0.14***	0.25***	−0.21***	0.13**								
10.	Openness	3.74	0.76	0.05	0.06	0.12**	0.15***	0.02	0.10**	0.04	0.08*	0.03							
11.	Fear of missing out	2.48	0.67	−0.29***	0.03	−0.29***	−0.19***	0.27***	−0.05	0.40***	−0.12**	−0.15***	−0.04						
12.	Preference for solitude	3.85	0.90	−0.04	0.06	0.01	−0.02	0.07	−0.35***	0.16***	−0.19***	−0.10**	0.19***	−0.08*					
13.	Quality of CMC	4.09	1.50	0.04	−0.04	0.16***	0.26***	−0.21***	−0.05	−0.13**	0.06	0.03	0.11**	−0.11**	0.08*				
14.	Quantity of CMC	5.23	1.32	−0.02	0.04	0.01	0.05	0.09*	0.18***	0.04	0.02	0.04	0.02	0.13*	−0.14***	0.14***			
15.	Perceived social closeness	4.00	1.41	0.07	0.04	0.19***	0.20***	−0.18***	0.10*	−0.10*	0.10**	0.07	0.12**	−0.12**	0.06	0.46***	0.18***		
16.	Number of different leisure activities *via* CMC	3.74	2.09	−0.33***	−0.07	0.01	0.10*	−0.00	0.15***	−0.01	0.04	−0.05	0.11**	0.17***	−0.11**	0.09*	0.33***	0.09*	
17.	Motivation to continue CMC after the pandemic	3.59	1.59	−0.03	−0.08*	−0.00	0.12**	−0.02	−0.19***	0.05	0.04	−0.05	0.16***	0.05	0.16***	0.49***	0.12**	0.35***	0.12**

*All results are based on n = 677. ***p < 0.001; **p < 0.01; *p < 0.05. Gender was dummy-coded (0 = male and 1 = female).*

TABLE 2 | Results of the multiple regression analyses.

Independent variable	Number of different leisure activities *via* CMC (R^2 = 0.185, p < 0.001)			Motivation to continue CMC after the pandemic (R^2 = 0.315, p < 0.001)		
	B^b	β	p^c	B^b	β	p^c
Age	−0.05 [−0.06, −0.04]	−0.319	<0.001	−0.00 [−0.01, 0.01]	−0.017	0.608
Gender[a]	−0.44 [−0.86, −0.01]	−0.081	0.038	−0.28 [−0.59, 0.04]	−0.068	0.071
Self-efficacy	0.02 [−0.25, 0.30]	0.006	0.888	−0.10 [−0.29, 0.10]	−0.040	0.354
Positive affect	0.26 [0.01, 0.51]	0.085	0.042	0.13 [−0.05, 0.31]	0.057	0.156
Negative affect	0.03 [−0.26, 0.30]	0.010	0.818	0.13 [−0.07, 0.33]	0.052	0.199
Extraversion	0.30 [0.10, 0.48]	0.124	0.003	−0.30 [−0.44, −0.16]	−0.165	<0.001
Neuroticism	−0.06 [−0.29, 0.17]	−0.027	0.583	0.03 [−0.12, 0.18]	0.015	0.737
Agreeableness	0.11 [−0.10, 0.31]	0.042	0.294	0.13 [0.00, 0.27]	0.069	0.053
Conscientiousness	−0.23 [−0.47, 0.02]	−0.072	0.076	0.01 [−0.19, 0.20]	0.004	0.922
Openness	0.36 [0.17, 0.55]	0.130	<0.001	0.23 [0.09, 0.37]	0.110	0.002
Fear of missing out	0.33 [0.08, 0.58]	0.106	0.009	0.18 [−0.01, 0.35]	0.075	0.059
Preference for solitude	−0.19 [−0.38, −0.01]	−0.083	0.050	0.12 [−0.01, 0.25]	0.070	0.069
Quality of CMC	N/A[d]	N/A[d]	N/A[d]	0.49 [0.41, 0.57]	0.463	<0.001
Quantity of CMC	N/A[d]	N/A[d]	N/A[d]	0.09 [0.01, 0.18]	0.076	0.038

[a]*0 = male and 1 = female.*
[b]*B values represent unstandardized regression coefficients and its 95% CI (bias-corrected and accelerated method).*
[c]*p values are based on bootstrapping with 5,000 iterations.*
[d]*Not applicable.*

others *via* CMC served as the dependent variable. The model explained 18.5% of variance, $F(12, 664) = 12.52$, $p < 0.001$. Age (β = −0.319, $p < 0.001$) was the most important independent variable and was negatively related to the average number of different leisure activities experienced with others *via* CMC. Gender (β = −0.081, $p = 0.038$) also showed a significant relationship with the dependent variable, whereby male experienced more leisure activities with others *via* CMC than women. Regarding the Big Five personality traits, only extraversion (β = 0.124, $p = 0.003$) and openness to experiences (β = 0.130, $p < 0.001$) showed a significantly positive relation to the number of different leisure activities *via* CMC. Positive affect (β = 0.085, $p = 0.042$) and fear of missing out (β = 0.106, $p = 0.009$) both showed a positive relationship to the dependent variable. In contrast, preference for solitude showed a negative relation (β = −0.083, $p = 0.050$). Importantly, the results of the multiple regression are completely consistent with the bivariate correlations between independent variables and the dependent variable (see **Table 1**).

Motivation for Computer-Mediated Communication After Contact Restrictions (RQ5)

In the final regression analysis, motivation of the participants to continue CMC after the pandemic served as a dependent variable (RQ5). In addition to the set of personal characteristics already used as independent variables in the first regression model in section "Inter-Individual Differences in Media Use for Leisure Activities During Contact Restrictions (RQ4)", we added the quality and quantity of current CMC in the context of leisure activities. Overall, the model explained 31.5% of variance, $F(14, 662) = 21.77$, $p < 0.001$. However, while some independent variables nearly missed the significance level, only four independent variables showed a significant relation to the dependent variable (**Table 2**). Two of these variables belonged to the Big Five: Extraversion (β = −0.165, $p < 0.001$) showed a negative relation and openness to experiences (β = 0.110, $p = 0.002$) showed a positive relation. Also, the reported quantity of CMC in the context of leisure activities during the pandemic showed a positive relation to the motivation to continue CMC after the pandemic (β = 0.076, $p = 0.038$). However, by far the most important independent variable was the (current) perceived quality of CMC in the context of leisure activities (β = 0.463, $p < 0.001$). Hence, the experienced quality of CMC was more important for future media use than the personal characteristics of the media users.

DISCUSSION

The results of the present study, conducted during the first nationwide lockdown in Germany in spring 2020, showed that people used and created new digital possibilities to stay in contact with others.

First, our data showed that the participants massively restricted their social contacts in their leisure time and thus obeyed the restrictions of the government. This is important to understand the data in its context, where important social needs could no longer be satisfied in face-to-face situations. The percentage of participants who used communication media more frequently in the context of leisure activities during the nationwide lockdown than before differed remarkably across media formats (RQ1). Synchronous communication formats were particularly popular among the participants, especially instant message services. Also, video calls and classic phone calls were used more often by over 70% of all participants.

This is consistent with the findings of Gabbiadini et al. (2020), who also found increased use of voice calls during the pandemic in an Italian sample study. Although it is unclear whether synchronicity influences on the perceived social support (Rains and Wright, 2016), our data indicate a clear preference for media that, in principle, enable synchronous communication.

Second, the participants reported performing and experiencing various leisure activities together with others *via* CMC (RQ2). This result is also consistent with the study by Gabbiadini et al. (2020), who found that leisure activities were shifted to the digital sphere, such as watching movies together or playing board games. However, we found a clear preference for low-key activities, such as just talking or simply spending time together. Nevertheless, more complex activities were also performed *via* CMC, such as having a drink together, eating together, and doing sports.

Third, the perceived quality as well as the quantity of CMC in the context of leisure activities during the lockdown showed a significant positive relation to perceived social closeness (RQ3). However, the quantity of CMC was not qualified as a moderator variable in the regression model. Hence, CMC is likely to maintain the perceived social closeness to others, whereby both quality and quantity of the communication process are relevant factors.

Fourth, we investigated the number of leisure activities performed and experienced together with others *via* CMC during the lockdown (RQ4). This number served as the dependent variable in a multiple regression model incorporating personal characteristics of the media users as independent variables. The age of the participant was the most relevant independent variable, with younger people experiencing more leisure activities *via* CMC. This result is in line with previous studies showing that younger people acquire media faster than older people (Czaja et al., 2006). Peer care and communication *via* social media were also found to be more prominent among younger people (Kumar and Lim, 2008; Blackwell et al., 2017). Mixed results were found regarding the relationship between gender and media use in previous research (cf. Ono and Zavodny, 2003; Kimbrough et al., 2013; Özgüven and Mucan, 2013), but in the present study, men reported experiencing more leisure activities with others *via* CMC than women. We also found that higher positive state affect was related to more leisure activities *via* CMC. Negative affect as well as self-efficacy were not significant factors. Regarding the Big Five personality traits, extraversion and openness to experiences were significant positive factors. Correa et al. (2010, p. 247) already found that "extraverted men and women were both likely to be more frequent users of social media tools.". Similarly, Horzum (2016) reported that people with a high degree of extraversion used social media for the gratification of meeting new people, socializing as well as for informational and educational gratifications. Furthermore, in the definition of openness to new experiences, it is already implied that new things are gladly tried out (McCrae et al., 1998), which is quite consistent in an unprecedented situation of restricted social contracts. Participants with higher (vs. lower) fear of missing out performed and experienced more activities in leisure time with other people *via* CMC. In addition, people with higher fear of missing out felt the need to maintain, particularly, high levels of social activity *via* media. In contrast, and not surprisingly, preference for solitude showed a negative relation to leisure activities *via* CMC. Overall, this set of personal characteristics explained 18.5% of the inter-individual variance in computer-mediated leisure activities during the lockdown. This amount of explained variance remains much room for other potential factors that are not considered here. In more positive terms, given that media literacy, media use habits, available technological infrastructure, etc., presumably also play an important role in this context, it is noteworthy that general personal characteristics that are not specifically related to media use are nonetheless relevant.

Finally, when participants were asked if they would be motivated to continue CMC after the pandemic, we found a different pattern of results. (RQ5): Although nearly one-third of the variance in this motivation (31.5%) could be explained by an extended model. Only two characteristics of the Big Five showed significant relations to use motivation in the future. People with higher (vs. lower) openness to experiences were more motivated to continue CMC even after the pandemic. Extraverted (vs. introverted) people preferred to return to face-to-face communication they usually prefer. Moreover, the current quality and quantity of CMC in the context of leisure activities showed a positive relation to the motivation for CMC after the pandemic. This result is in line with the central assumption of the U&G approach, according to which satisfied expectations predict continued use of a medium (Palmgreen and Rayburn, 1982).

Limitations

Some limitations of our study are mentioned. First, the present study consisted of self-ratings and did not allow a detailed analysis of the specific style and quality of computer-mediated leisure activities. Second, the participants were recruited through convenience sampling, which means that we may have reached a certain milieu of being not representative for all media users. For example, the mean age of the sample was about 34 years and the study was limited to the status quo in Germany during the first nationwide lockdown in 2020. Indeed, some moderate cross-cultural differences in motives of people for media use and associated gratifications have been reported before the pandemic (e.g., Lee et al., 2014; Sheldon et al., 2017). However, there is no valid reason to believe that German citizens differ substantially from everyone else in their online communications during contact restrictions due to the COVID-19 pandemic, but available technical infrastructure, access to media, and cross-cultural differences regarding preferences for specific leisure activities may be moderating variables. These factors limit the generalizability of our results. Third, the extent and specification of contact restrictions and lockdown conditions may vary across regions and over time.

Fourth, during the ongoing pandemic, it is conceivable that people have successively become familiar with the situation, have gained specific media competencies, and purchased technological equipment, facilitating the way of computer-mediated activities with others. Fifth and the last, our data are cross-sectional, correlational data so that no causal conclusions can be drawn.

Practical Implications

The results of our study have important practical implications. We found that people use digital media in many different ways to stay in contact with their family and friends. Our results indicate that older people perform fewer different activities *via* digital media for this purpose, which could be related to their slower appropriation of digital technologies (Czaja et al., 2006). During contact restrictions, it was recommended not to visit retirement homes, hospitals, and nursing facilities because of the vulnerable people who live there (e.g., Dichter et al., 2020). Due to this situation, older generations could become lonely (Kemptner and Marcus, 2020). CMC could be one possibility to counteract this risk. Therefore, it seems important to support older generations (and other vulnerable people) in their media activities so that they can stay to be in contact with their family and friends *via* media. It should be noted, however, that only around 20% of people over the age of 85 who live alone in Germany have an internet connection to date (Kemptner and Marcus, 2020). The critical infrastructure must therefore be expanded. Especially in Germany, there is still a lack of ultrafast broadband connections (Martins and Wernick, 2021), which can influence on the quality and quantity of media use. We showed that the quality and quantity of CMC were positively related to the perceived social closeness to other people, which underlines the urgency of better internet connectivity and access to digital media. A fast internet connection is particularly important as video calls were one of the most preferred communication formats used by about 70% of participants more frequently during the lockdown than before. Besides, media literacy of users must be enhanced, because many leisure activities migrated into the digital world. Enhancing media literacy among users can increase both knowledge of and criticism toward media, and furthermore, ensure awareness of the influence of media as well as reduce risky or antisocial behaviors (cf. Jeong et al., 2012; Rüth and Kaspar, 2021).

Furthermore, we found that there are inter-individual differences in the extent of leisure activities *via* CMC and motivation to continue CMC even after the pandemic. Different groups of people prefer different ways of communication, for example, extroverts (vs. introverts) prefer face-to-face contact rather than digital communication. On the one hand, these differences have the advantage that like-minded people network with each other and thus form homogeneous groups, which generate a higher sense of equality (Himmelroos et al., 2017). On the other hand, the formation of these homogeneous groups can lead to echo chambers which could enhance polarization (cf. Baumann et al., 2020). In order to prevent such group formation processes, to achieve as much diversity as possible, and to create a satisfying experience with digital media for all users, it seems important to improve the usability of systems. One standard that can be used to judge systems is ISO 9241-11 (1999), which was developed by the International Organization for Standardization and addresses the compatibility of software for the needs of users. It includes important aspects in the design of systems that satisfy individual needs, for example, suitability for the task, self-descriptiveness, conformity with user expectations, and notable suitability for individualization. It seems important to consider the user of digital systems as an active user who selects media entirely according to his or her individual preferences. Our results support the assumptions of U&G in this regard.

CONCLUSION

To sum up the results of the present study, we found an important role of digital media in maintaining social contacts. Especially in times of a pandemic, when local lockdowns and contact restrictions repeatedly occur, digital media can help to continue leisure activities with other people and maintain the perceived social closeness to others through CMC. Moreover, personal characteristics, as well as the quantity and quality of current CMC, are associated with the extent to which people perform and experience leisure activities with others *via* digital media. Hence, a more differentiated perspective on the inter-individual differences between media users would be a promising step to create even more satisfying communication formats.

DATA AVAILABILITY STATEMENT

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

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants voluntarily participated in this study and indicated informed consent to participate by clicking a corresponding box.

AUTHOR CONTRIBUTIONS

JM, KK, and JN developed the study idea, interpreted the results, and wrote the manuscript. JM and KK designed the study and performed the analyses. JM and JN collected the data. KK organized and supervised the data collection. All authors contributed to the article and approved the submitted version.

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Uses of Digital Mediation in the School-Families Relationship During the COVID-19 Pandemic

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The COVID-19 pandemic has sharpened the inequalities in our societies. In Spain, we observed that the impact on schooling varied according to socioeconomic, gender and sociocultural variables. In this article, we present a case analysis illustrating the impact of the COVID-19 pandemic on schooling in early educational grades (ages 3–6), which leads us to focus on school-family relationship. First, we present some studies that show the inequalities in education during the lockdown period, the digital divide faced by both schools and families and how digital mediation impacts school-family relationships. Then we will introduce our study, which aims to explore the uses, potentials and limitations of an app intended to facilitate the relationship. Our study took place during September 2020-January 2021, when social restriction persisted. It took the form of a telematic ethnography in which we monitored the meetings of the Early Childhood Education teachers and their interaction with the families via an app-based communication tool. Results have allowed us to identify that most conversations are initiated by the school and their aim is to show families the classroom activities. We have also observed some advantages regarding the use of this app: communication can become more direct and immediate, and teachers have developed strategies to foster proximity in this relationship, as well as to respond inclusively to diversity. Regarding the challenges, we identified the lack of involvement of some families, the need to transform the roles played by families and children, and the difficulty to maintain personalized relationships.

Keywords: funds of knowledge, digital interaction, school-families interaction, schools on pandemics, mobile app uses

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PANDEMIC AND DIGITAL DIVIDE

The crisis generated by the COVID-19 pandemic has impacted schools around the world. There was a first phase (more or less prolonged, according to the circumstances in each country) characterized by home confinement and the cessation of face-to-face educational activities. This was followed by a second phase in which students returned to classrooms, but subject to restrictions and measures to ensure social distancing.

Focusing on the first phase, the physical closure of the schools in Spain took place without a contingency plan for the lengthy duration of this situation (in most European countries it persisted until the end of the school year, a period of 3–4 months). As a result, academic authorities

and school boards had to improvise mechanisms for the continuing implementation of distance learning with the resources available at that time. The need to organize effective forms of distance learning severely tested schools' capabilities. On the one hand, the necessary technological resources for virtual two-way communication had to be assured, both in schools and in the students' homes (Bozkurt and Sharma, 2020). On the other hand, teaching methods had to be mediated by technologies appropriate for distance learning. In some cases, these methods had already been developed, but in others they had to be improvised (Schleicher, 2020).

The pandemic-induced school closures have aggravated social inequalities, as is starkly apparent in households' access to the resources that enable remote connection (Casado et al., 2018). According to the COTEC Foundation study, 66% of the students with a high socioeconomic level have three or more computers at home, compared to just 10% of those with a low socioeconomic level, most of which have only one (45%) or none (15%). Additionally, the gap in school digitisation is manifest from the ownership of the centers. While only 45% of the heads of public schools believe their teachers are trained to integrate digital devices into their classes, this figure rises to 69% in subsidized schools and 76% in private schools (Zubillaga and Gortazar, in press).

The data currently available suggest that the pandemic crisis is widening the gap in access to formal education, depending on the families' socioeconomic capacity and cultural capital and the schools' resources. In Catalonia (the region in which our research was conducted, at a school in Barcelona), Bonal and González (2021) revealed the impact of the pandemic on the educational and social divide. These authors conducted a macro-survey of over 30,000 families during the 1st months of lockdown. Their results show a digital divide that affects families of low socioeconomic status, which is manifest in indicators such as the availability of digital devices (in many cases there is less than one per person, or even just a single device, a mobile phone, for the entire family). This parameter is directly related to the time that students can dedicate to connected-at-home classwork. The statistic that best illustrates the impact on these families is that of "opportunities to learn," reflected in variables such as support for home working, online communication with the teacher and the timely correction of homework by the teacher. The study found that 28.3% of the students in this socioeconomic group dedicated <1 h a day to school activities, lacked access to communication with the teaching staff and did not have their homework corrected. The authors also found that the degree to which families help their children with schoolwork, a factor that is especially relevant during lockdown as all class activity takes place in the home, and depends heavily on the parents' own educational background. Thus, 35% of the mothers who had only completed compulsory education helped their secondary school children, while 45% of the university-educated mothers assisted their children. The corresponding figures for the fathers were even more marked, at 16 and 32%, respectively. Family and extracurricular activities, which make a notable contribution to school skills, were also associated with the parents' social class.

These observations are derived from a study in which the population sample was biased by socioeconomic, gender and sociocultural variables. Since Bonal and González (2021) conducted the study during the lockdown, it was necessary to have internet connection, time and interest to respond to the questionnaire. This might explain why the participation of families with university-educated parents was significantly higher than that of the population. It would seem reasonable to hypothesize that the situation is much worse than the impression provided by this study, since it is precisely the families that suffer most from the digital divide that are least likely to have taken part.

During pandemics, school-family relationships became particularly important. Telematic classes challenged the physical space of learning (traditionally associated with schools) and homes became the new classroom. This means that families not only be able to afford internet connection and digital artifacts, but also appropriate space, equipment and environmental conditions for class participation. Parents became mediators of the teaching-learning process (the younger the child, the more important the role played by the parents), supervising communication with school and providing the material, intellectual and emotional resources necessary for the activity to take place (Trujillo-Sáez et al., 2020). In many cases, the scarcity of these resources was aggravated by the economic impact of the pandemic: parents had less time to support their children's school activity due to the need to seek alternative informal income, or because they remained in employment but performed essential low-skilled tasks, which were necessarily on-site.

Tarabini and Jacovkis (2020) conducted an online questionnaire during the lockdown. Answered by 2.777 teachers from Catalonia, the results in this report highlighted the social gap that affects schools, students and their families. According to their results, many families had access to the internet on their smartphones; while computers were much less frequently available (according to 34.5% of the teachers, very few of the families whose children attended their school had a computer in the house). Similarly, children were much less likely to have a digital device available for their exclusive use. This is consistent with the results on the participatory design research conducted by Gros et al. (2018) with migrant population in Barcelona: the participants are actually involved in our mobile-centric society (González-Patiño and Esteban-Guitart, 2014) showing that, despite of their socioeconomic situation, the smartphone is central in their lives. Moreover, the authors invite us to think not only in terms of access to technology and the internet, but the usage of it. This is the so-called second digital divide (Büchi et al., 2015). In this sense, the study by Gros et al. (2018) shows that the principal usage of the smartphone is social interaction and communication (by call or social networks) that connects them to their families and friends and facilitates daily life (such as e-mail or weather forecast).

Innovation in School-Family Relationships and Digital Technologies as a Tool

In contrast to this gloomy picture, educational observers have reported that many schools, despite the difficulties encountered

during the months of lockdown, have revealed great reserves of creativity, resilience, and innovation in coping with the situation (Cervantes Holguín and Gutiérrez Sandoval, 2020). This aspect of the real-world response is not reflected in the prior, quantitative-based research data that we cite, and which have proliferated during this period. In this line of argumentation, Iglesias et al. (2020) identify schools whose resilience to the crisis would be found in relation to the innovation processes that were underway before the pandemic.

In schools with most students from families that do not belong to the hegemonic culture or to wealthy socioeconomic backgrounds, these innovation processes often correspond to a rethinking of relationships with families. These new models start from a critical perspective of the deficient perspective of the low academic performing students and their families. According to the model of family-school discontinuities (Poveda, 2001), differences in performance can be explained by a lack of coherence between the values and interaction formats of school and family. This is because school practices and values are not neutral, but rather reproduce the hegemonic culture typical of well-off socioeconomic contexts (Tozer, 2000). To transform the school to be coherent with the family, it is essential to build fluid and close personal relationships (Poveda, 2001). Bronfenbrenner (1979), in his ecological theory, has highlighted the importance of collaboration, mutual understanding and agreement between microsystems -in this case, the school and the family- to favor human development -in this case of the boy or girl-, creating educational continuities between both.

However, family-school relationship is not built from neutrality, but within the framework of the school institution. Therefore, it is based on the parameters of the hegemonic and middle-class culture and, in addition, asymmetric power relationships come into play in these links (Whyte and Karabon, 2016), as well as the legitimation of a certain worldview and understanding of what school education is, and how families should be involved in it. Often, teachers identify family attitude as an obstacle to bonding with them (García-Bacete, 2003). Instead, teachers should assume the responsibility to build diverse and equitable relationships with families. This requires a progressive approach to co-responsibility, and an openness to transforming traditional school/family relationship formats (Collet-Sabé et al., 2014).

Consequently, it is necessary to promote accessibility so that families feel recognized and welcomed in school, so that they can utilize the knowledge currently invisible by the deficit paradigm (Esteban-Guitart and Vila, 2013a). In this sense, new models propose to leave behind a communication focused on negative aspects of the students, guaranteeing that there is also space to deal with their potentialities (Epstein, 2002). In addition, they require the creation of prior intersubjectivity between both agents that allows favoring two-way communication, information between contexts—that is, families can also share with the school their daily activities, tastes, values and knowledge (Oliva and Palacios, 1998; Epstein, 2002)—and mutual trust (Esteban-Guitart and Vila, 2013b).

In addition, moving toward the recognition and legitimation of marginalized cultures implies coping with the conflicts that may arise between school and family cultures (Tozer, 2000). It is necessary to accept that conflict is part of relationships, so strategies must be sought for its resolution with respect, dialogue and trust (Epstein, 2002).

One concrete proposal that aims to respond to the challenges presented by discontinuities between family and school is the funds of knowledge approach (González et al., 2005). From this perspective, it is assumed that all families (regardless of their origin, culture, language, religion, economic situation, etc.) have knowledge, skills and relationships. Therefore, they have resources that can contribute to academic learning. This approach is specified in the formation of a teaching team in ethnographic research -through a study group focused on funds of knowledge-, as well as in the implementation, by the teaching staff, of ethnographic visits to the homes of some families (Moll, 2014). These visits have the aim of identifying household knowledge so that they can be integrated into classroom life and generate curricular learning.

Various studies focused on funds of knowledge show how teachers become aware of their own prejudices toward families, of their position of power, of the ethnocentrism and racism that pervades the school institution and conceptions about upbringing (Zhang-Yu et al., 2020), etc. Therefore, through home visits, it is possible to question traditional and established teachers' roles as expert, modifying the asymmetry and enabling closer relationships (Whyte and Karabon, 2016).

However, given the current pandemic situation, approaches such as this are limited by the restrictions imposed. According to Iglesias et al. (2020), the situation caused by COVID-19 highlights social and educational inequalities that already existed. To respond to them, personal engagement and care are very important, as well as the need to diversify forms of relating to families. In addition, COVID-19 restrictions impose new forms of relationship in which digital technologies open up new possibilities. The great challenge is to identify, in this dystopian situation, the opportunities to accelerate changes toward educational improvement (Iglesias et al., 2020).

In recent years, the emergence of new digital technologies and their permanent and ubiquitous accessibility to information (Jenkins, 2006) has transformed our way of being, doing, learning and relating. Technology has become part of the day-to-day life of most school and family contexts. However, although technologies have entered the classroom, they do not usually transform teaching-learning processes and, much less, family-school relationships (Grant, 2009; Macià and Garreta, 2018).

There are many authors who defend the great potential that digital technologies can have to improve family-school relationships. Among the benefits that stand out, we highlight its potential for: (a) the creation of more open and collaborative educational communities; (b) the participation of those families that usually do not get involved in school (Vázquez et al., 2014); and (c) the creation of new contexts and patterns of knowledge, which favor the construction of more democratic and participatory schools (Aguilar and Leiva, 2012).

They can also contribute to the creation of a third space (Gutiérrez, 2008; Lalueza et al., 2019), that is, a hybrid space in which the different motivations of the participants (students, families and teachers) are legitimized, and in which, thanks to negotiation processes, shared learning objectives are created

(Gutiérrez, 2008; Lalueza and Macías-Gómez-Estern, 2020). Finally, this approach increases the quality of communication so that all members of the school community become producers, not merely consumers or receivers of knowledge (Fischer and Bloomfield, 2019).

However, desirable there is also agreement that these potentialities are not used in practice (Beneyto-Seoane and Collet-Sabé, 2016). Some of the obstacles identified to using digital technologies in a transformative way in family-school relationships are the lack of infrastructure or material, inadequacy of training (both for families and teachers), inequalities of access, and unfavorable attitudes toward these resources (Beneyto-Seoane and Collet-Sabé, 2016; Macià and Garreta, 2018). Finally, the lack of reflection and evaluation on the use of these tools also limits their transformative potential (Grant, 2009).

However, given the current pandemic situation, what seemed like a desirable option has become an imperative to promote continuity of family-school relations. Digital technologies are currently an essential channel for communicating and connecting with families. Therefore, it seems relevant to highlight some fundamental ideas on how to use these tools in a transformative way.

CONTEXT OF THE RESEARCH

This study has been developed in a public school located in the Bon Pastor neighborhood, a working-class environment in Barcelona, Spain. Most of the students (aged 3–16 years old) belong to Roma ethnicity, or are descendants of African, Asian or Latin American migrants.

This study has been conducted in the framework of a longer-term action-research programme (Lamas and Lalueza, 2012; Lalueza et al., 2020; Lamas et al., 2020; Walker et al., 2021). For almost 2 years before the declaration of the pandemic we had been implementing a Funds of Knowledge exercise as a strategy to transform school-family relations within Early Childhood Education. Due to this experience and our positioning within the school, we were able to follow events *in situ* during the lockdown and after. So, the researchers had direct access to the school activity during the lockdown, monitoring the teachers' meetings regarding the strategies to be adopted by the school for virtual relationships with the children's families.

When the state of alarm was decreed in March, schools were suddenly faced with the need to connect the teachers, the children and the families, in their respective homes. At the school examined in this study, the teachers were contacted and coordinated by e-mail and telephone, but these channels were soon replaced by videoconferencing. Connection with the families was first established by telephone. The management team called each family, one by one (only one family could not be located by this means), and this initial contact served to identify the children's main needs.

The first necessity was to respond to basic nutritional demands, since many of the children had been receiving free school meals, to ensure a nourishing, balanced diet. This service had been compromised by the closure of the school. Furthermore, many families were in a precarious economic situation, having been deprived of their livelihood by the lockdown. The distribution of food vouchers was a major priority during the first round of contacts, as the school considered the children's welfare to be its primary function, well-ahead of academic concerns.

Secondly, the school addressed the emotional and social needs arising from the enforced isolation. Telephone conversations informed the school about the families' situations, how they were coping and about the lack of space and resources that many were experiencing. Paradoxically, the absence of face-to-face contact enabled us to learn more about the lives of these children and their families. Many families expressed their appreciation of the school's efforts: just making contact and expressing the school's concern was warmly welcomed and, the school managers believe, reinforced mutual trust.

The third priority was to draw up guidelines for action and challenges that would keep the students focused on goal-oriented activities. Accordingly, strict adherence to the school curriculum was the last of our concerns. Thus, according to Tarabini and Jacovkis (2020), while at many of the schools attended by children from middle and upper-class families, the school's connection with families at home was aimed at maintaining curricular activity, in our case, issues such as food availability and emotional well-being took center stage, relegating curricular learning to a secondary consideration.

As commented above, the first medium used to relate with families was that of the telephone. This channel was necessary and irreplaceable for making the first contact, but is inefficient for long-term communication, since it requires a synchronous connection for each family. Hence, new forms of interconnection emerged, based on the use of mobile phones. Very few of the families had access to a PC, laptop or tablet, but all had at least one mobile phone, and this instrument provided a resource and a dimension that was both "natural" and radically different from landline-based phone calls.

Furthermore, the use of mobile phones as a means of communication was supported by pre-lockdown experience, so that we were aware which approaches and methods worked and which did not. In the analog experience, course meetings, parent-teacher association meetings, interviews unrelated to specific problems and printed circulars were all ineffective as channels of communication. Similarly, among digital resources, neither the school's website nor its use of e-mails proved satisfactory. On the other hand, just as in face-to-face activity before the pandemic, meetings at the school gates at the beginning or end of the school day, activities related to the presentation of the students' audiovisual output and meetings arising from the Funds of Knowledge programme all worked well. Also effective, in digital communication, were Instagram and a communication app called Dinantia[1]

Prior to the pandemic, Instagram had served as a showcase for activities carried out within the school and during

[1]https://www.dinantia.com/en/.

TABLE 1 | Data categorization.

Thematic blocks and theoretical questions	Dimensions
Block 1: School-family continuity in a context of cultural diversity and social vulnerability	
Do current practices related to the school-family relationship and to the use of digital technologies allow or favor…	
• … awareness of the deficit paradigm and the adoption of a critical attitude in this respect?	Focusing on the families
• … awareness of the ethnocentrism and racism of the school institution (and of us all, individually), spurring us to transform these outlooks?	
• … awareness of the power relations present in the family-school relationship, especially in contexts of discontinuity, and their transformation into reciprocity?	
• … the existence of two-way communication and information exchange between the contexts of school and home?	Bidirectionality
• … the identification, appreciation and legitimization of sociocultural practices, values, languages and relationships that differ from those of the hegemonic culture?	
• … the socio-interactive repertoires of all cultural groups involved to be incorporated into classroom life?	
• … the evaluation and improvement of all these practices?	Evaluation
Block 2: School-family continuity via relational and affective factors	
Do current practices related to the school-family relationship and to the use of digital technologies allow or favor…	
• … the existence of smooth, continuous communication?	Access to teachers
• … families' feeling comfortable, welcomed and recognized in their relations with the school?	Affectivity
• … mutual trust?	
• … interaction not only regarding conflictive questions, but also positive ones?	
• … the recognition and resolution of conflicts through dialogue?	
• … contextualizing school-family relations according to the characteristics of each family?	Attention to diversity
• … the school to improve its relationship with all families?	
• … the construction of diverse and equitable relationships, offering families diverse ways, times and strategies for communicating with the school and enhancing their involvement?	
• … the inclusion of every family, not just those which are easily addressed?	
• … the evaluation and improvement of all these practices?	Evaluation
Block 3: School-family continuity via digital technologies	
Do current practices related to the school-family relationship and to the use of digital technologies allow or favor…	
• … building a more participatory, open and democratic educational community?	Participation by the families
• … families to become producers of content and not just recipients?	
• … families to become involved in decision-making regarding the use of mobile app?	
• … learning contexts to be connected via the creation of a third space?	Connection between learning contexts
• … children's playing an active role in family-school mediation?	
• … greater efficiency in communication?	Efficiency
• … the evaluation of mobile app as a means of enhancing the family-school relationship?	Evaluation

outings. During the lockdown, it provided a tutorial for families with children in Early Childhood Education and in the 1st years of primary school. It also constituted a hub of proposals for family activities. The mobile app, on the other hand, was a one-way communication tool that had previously been used as a substitute for the school's provision of printed information to families. During lockdown, it was activated as a bi-directional tool, enabling a permanent means of communication via messages, files, images and videos.

METHOD

Aim

The aim of this study was to identify the uses of digital communication channels in school-family relationships, the opportunities offered and the limitations that may be encountered, in the Early Childhood Education grades of a public school in a low-income environment.

Data Collection

Our study took place during the period September 2020-January 2021, and took the form of a telematic ethnography in which we monitored the meetings of the Early Childhood Education teachers and their interaction with the families via an app-based communication tool.

The research team held three virtual meetings with the teachers (in September and October 2020 and in February 2021), and one researcher attended the twice-weekly meetings of the Early Childhood Education teaching team during November, December and January. In every case, a field diary was used to systematically collect information about the school's relationship with the families. In addition, we had access to the smartphone app, which allowed us to observe and analyze the communication

established between the families of one of the classes, the class tutor (who was also the grade coordinator) and the school. This class was made up of 17 children, corresponding to 15 families (there were two pairs of siblings). Specifically, we had access to all the group messages (addressed to all the families in the community or in the class), throughout the term, individual messages (i.e., those exchanged between a single family and the teacher) and institutional messages (generated by the management team) sent in November and December 2020. In addition, we held two virtual meetings with the grade coordinator which helped us understand the school operation. The content of these meetings was included in the field diary, as well. Finally, we conducted a face-to-face semi-structured interview with the same coordinator, discussing the limitations and potential of the resources for managing relationships with families in the current situation. This interview was recorded on audio and transcribed for later analysis.

Analysis

The information obtained from interviews, the monitoring of teachers' meetings and the messages sent via the app were transcribed and analyzed as textual data. For this purpose, data were categorized into three thematic blocks, all interrelated but focusing on specific areas of interest. For each of these blocks, the research team formulated a series of questions guided by the theoretical framework (see **Table 1**).

The researcher who conducted the fieldwork (León-Nabal) identified each textual quotation categorizing it as a response to one of the questions in the table, and this assignment was later reviewed by the other two team members. After discussion, the final category system was agreed upon by consensus. So, the category system did not arise from three independent coding in origin, a limitation according to Anguera et al. (2018), but we have prioritized the continuity between fieldwork and analysis, privileging the researcher's gaze in her interaction with the investigated object.

Since not all the citations correspond to the use of the mobile application, the object of the study presented here, those that did refer to this tool were selected, and together they were grouped for presentation into three groups: (a) uses and contents of communication, (b) strategies used and perceived advantages, and (c) difficulties and challenges encountered.

RESULTS

Uses and Contents of Communication

In the present school year, family-school relationships for children in Early Childhood Education (3–6 years) have been limited almost entirely to contacts via the smartphone app. Beyond this instrument, teachers and families have only met at the school gates, at the beginning or end of the school day (briefly and with social distancing) and in personal interviews (only face-to-face when strictly necessary). Other resources such as telephone calls or e-mail have been used only occasionally.

Although this app was first used in 2019, the possibility of bidirectional messages (so that families could also send messages and interact with their children's teachers) was not activated until lockdown began. In the school year 2020–2021, this facility was maintained, although the platform does not allow families to interact with each other. The mobile app is used for different types of messages, depending on the sender and to whom it is addressed:

- General messages: Notifications for the entire educational community (such as the school meal menu for the coming month or news of COVID cases in the school).
- Group messages: Addressed to all the families and teachers of a school year, age group or class. At least one is sent every Friday to report—through a text, images and/or video—the week's activities in class. The school also sends out a "news bulletin" advising families of upcoming important events.
- Individual messages between a family and the teachers, for example, to notify of inability to attend. In addition, every month or two, the teachers send the parents individual or small group photos of their children.

The frequency of each use is detailed in **Table 2**):

a) in-school activity (showing families the activities carried out in the classroom and elsewhere in the school, as well as messages sharing the school's weekly music schedule).
b) at-home activity (showing the teacher an activity carried out in the family context).
c) gratitude (expressing thanks, for work done, photos sent or any other detail appreciated).
d) mood (describing the child's mood or attitude in a certain situation, for example, if they were crying on being left at the school gates, reporting that they have since calmed down).
e) logistics (communicating information related to the timetable and/or calendar, materials that need to be brought to school, personal image rights, confirming an appointment

TABLE 2 | Content of mobile app messages according to sender/receiver status.

Type	Frequency	Content	Frequency
General	10	School activity	3
		Logistics	3
		Health	2
		Monthly menu plan	2
Group	25	School activity	19
		Logistics	4
		Health	1
		Theory	1
Individual initiated by the school	9	State of mind	3
		Logistics	3
		Health	2
		Thanks	1
Individual initiated by the family	21	Logistics	11
		Thanks	5
		Health	2
		Home activity	2
		State of mind	1

for a personal interview or reporting the child's absence from school).
f) school meals (informing families of the school's menu for the next month).
g) health (reporting symptoms, wounds, the presence of lice or a positive case of COVID in the school).
h) theory (sharing information related to developmental and educational theories).

With the app, it is usually the school that initiates conversations with the families (at the general, group or individual level). The main aim of group messages is to show families what their children are doing at school, using text, photos and videos. However, only six of the 15 families in the group have read all these weekly messages, while another five have done so practically every time (leaving no more than three messages unread). On the other hand, one family did not read any messages until November and another started in December. There were two more families who did not read any message at all. However, one of them was not taking his child to school. This family has recently informed the school that he was transferred to another center.

Regarding messages initiated by the families, 8 out of the 15 families in the class sent messages to the teacher during November and December. In total, the families initiated 21 individual conversations with the teacher, although five of these were in response to a group message with photographs. Most of these messages (11 out of the 21) concerned logistical issues such as dates, timetabling or absences. In addition, there were five messages of gratitude for the images sent by the teacher, two referring to health issues, two showing the teacher the child's activities in the family context and one regarding the child's state of mind when entering school.

Strategies Used and Perceived Advantages

Our analysis of the contents and use of app mobile and of the regular meetings between teachers, together with the interview with the research coordinator, highlights the advantages of this type of communication, and reveals the strategies developed and used by the teaching team in their relation with the students' families, in response to the needs and challenges that have arisen in the present circumstances.

In the first place, according to the grade coordinator, families enjoy greater access to the teachers, who can obtain direct, immediate communication with their child's tutor, without intermediaries, albeit restricted to written and virtual formats (and although other, face-to-face, channels have been lost).

> *"Families know they can write to the teacher whenever they want. It's me who reads their messages, there are no intermediaries, it's more direct"* [Coordinator_Interview_16.12.20].

Secondly, despite the inevitable limitations imposed by the virtual format on the "personal touch," some strategies can be used to foster proximity in the relationship.

For example, sometimes children are agitated or crying when they arrive at school; on three occasions when this happened, the teacher sent the parents a message and a photo which showed the child playing after calming down. For instance:

> "*Good morning. *** is fine now and she is playing happily, as you can see in this photo. We'll see you at 12.30.*"
> Attached file: Photo of the child in the classroom.
> [App_IndividualMessage _11.11.20].

Emoticons can also accompany the text. For example:

> "It's nothing serious, but he'll come out today with a few scratches"
> [App_IndividualMessage _30.11.20]

Communications via the app always show the students and their classroom activities in a positive light. According to the school's head teacher, in an interview conducted in July 2020, previously it had been difficult to find the right moment to let the families know about the things that were going well. So, the mobile app may have generated new communication opportunities with the families about the positive aspects of their children's schooling.

Thirdly, teachers have developed strategies responsive to the diversity of these families. When the educational focus is on inclusion, the school must offer different responses according to the needs, potential, interests and characteristics of the children and their families.

Within the app itself, the teacher uses strategies to contextualize and personalize her messages, thus addressing the diversity of families. One of these strategies consisted of translating the messages into Spanish, since the child's mother did not understand Catalan. Another strategy was to replace the weekly group message with an individual message with photos -in which the child appeared either alone or in a small group- to each family. This kind of message was sent twice and was answered by five families with a message of thanks. Prior to this innovation, none of the group messages had received replies. Virtually all the group messages included not only text but also emoticons, illustrations and images, and sometimes videos, thus diversifying the ways in which information was provided.

> *"Our families really like to see photos, which is why in all our weekly group messages we send them photos or videos."* [Coordinator_Interview_16.12.20].

However, the teachers have had to face another challenge: some families do not use the app (they do not read or do not reply to the messages), despite its being one of the most important channels of communication between the school and the families. The teachers have overcome this problem with two of the four families involved by taking advantage of the few moments of face-to-face contact (during interviews and at the school gates during the children's entry and exit) to demonstrate the app and encourage its use.

> *"For example, if a form needs to be signed, the parents do it using Dinantia. But we let the families know about this in person, when the children are coming out of school, and explain how to do it."* [Coordinator_Interview _16.12.20].

Difficulties and Challenges Encountered

The current situation, which is both uncertain and complex, is posing new challenges to the development of a good understanding between the school and the families, and to ensuring continuity between the two main educational contexts—learning and activities—in Early Childhood Education. Although this school has successfully developed new ways of communicating with the children's families, there remain areas where further reflection and improvement are needed. Challenges we have found involve (a) the level of participation and quality of communication, (b) transformation of roles played by families and children, and (c) maintenance of personalized relationships.

The first of these major challenges mainly concerns the families who do not read the messages sent. As we have shown, two of the 15 families did not read any of these messages. According to the teacher in question, various explanations might account for their non-involvement. On the one hand, these families may lack access to infrastructure or material resources:

> *"Perhaps the family's mobile phone has broken, or they haven't got one, or now they do, now they don't, or the number has changed"* [Coordinator_Interview_16.12.20].

Alternatively, according to the teacher, there may be a lack of interest in school matters:

> *"I think the reason why this family doesn't read the messages is just that they can't be bothered, it's because they think: "If it's just so you can tell me to bring an apron, well, I'm not going to bring it anyway." That's the attitude of this particular family. (...) Maybe they would like to have the photos, but they don't want to do all that's necessary: put your contact details on their phone, download the app, all the rest... On the other hand, they do know how to do tiktoks... I think it's just they're not very interested in school affairs."* [Coordinator_Interview_16.12.20].

Even so, perhaps we should reflect on whether this lack of involvement with the school might have arisen from the wide gap that still exists between the school's and the family's forms of socialization, as has been suggested by Collet-Sabé et al. (2014).

Finally, the scant involvement of some families in reading the messages and in interacting via the mobile app might be due to a simple lack of digital competence:

> *"The coordinator told me that some families lack digital skills, and so it's difficult for them to use the app correctly, even after it was explained to them and after she went over to show them."* [Blanca_FieldNotes_27.11.20].

A second challenge is to transform and re-assess the roles played by families and children in this relationship. As we have seen, although some families use the app to interact with the teachers, this technological resource is not generally used by families to share their activities, preferences or family understanding with the school. Moreover, in the only two cases in which families have shown the school something about their household, this was, according to the teacher:

> *"It's only because I insisted, at the school gates. They told me about it (for example, the child's handicraft work) and I said, Why don't you send me a photo? I do try to create some kind of link, a relationship, but this doesn't work, either..."* [Coordinator_Interview _16.12.20].

The same teacher, when asked why the parents didn't often send these types of messages, observed:

> *"Maybe it's because they don't know? Perhaps they think, What can I send the teacher? Maybe they're just cautious and don't want to bother us."* [Coordinator_Interview _16.12.20].

On the other hand, the way teachers use language through the app also influences the role played by the family in this interaction, since it may accentuate the asymmetric power relations between the family and the school. In this sense, we have identified situations in which the teacher addresses the family using a formal, technical register, one that is more typical of the hegemonic school culture, and which might be difficult for many families to understand:

> *"The preventive use of insecticide products is not recommended for persons not affected by pediculosis. (…) They are sometimes confused with dandruff and seborrheic scales, but neither of these formations is attached to the hair and they are easily removed. Moreover, dandruff does not produce the pearly shine of nits."* [App_GroupMessage_9.11.20].
>
> *"The constructions are not only for play, they also teach us a multitude of mathematical and physical concepts, such as geometric shapes, series, sizes, comparisons and classifications"* [App_GroupMessage_20.11.20].

We have also identified messages in which proposals were addressed to families about how they should interact with their children, from a clearly ethnocentric perspective:

> *"Now that Christmas is almost here, and we're all thinking about what toys to get our children, we want to help you consider how to enrich their games, with guidelines that will encourage them to grow, learn and develop without falling into the traps of sexist and gender-role stereotypes, and thus promote equality."* [App_GroupMessage_22.12.20].

Such communications were sent to the whole group, in the form of information bulletins, and contrast with the warmth of the personal messages intended to keep the families in touch with each other. These "cold" uses of language perpetuate asymmetric power relationships, thus generating further inequality.

These considerations lead us to reflect on the roles played by families in determining the use made of the mobile app. In this case, the families were not part of the process; it was school personnel who decided to introduce the app, and decided how it should be used—initially to replace printed handouts, and currently as a two-way communicative tool enabling teachers to show the families what their children do at school.

A third challenge presented by the pandemic situation consists of constructing emotional ties with families. Although the teachers do their best to maintain close relationships through the

virtual format (as described in the previous section), it can be difficult to maintain affectivity in the relationship when there are no face-to-face encounters:

> "*This year is different, there's less bonding, before there was more. We've lost this good relationship.*" [Coordinator_Interview_16.12.20].
>
> "*Written messages are very impersonal; a message could be interpreted in many ways. Moreover, we have families who don't read the messages or who do read them but don't usually reply.*" [Coordinator_Interview_16.12.20].

Finally, to make changes in the relationship with families, it is necessary to have moments and spaces for evaluation of and reflection on one's own practice. The practice of the Knowledge Funds project involved dedicating two sessions a month to reflect on relationships with families, which was interrupted by the pandemic situation.

> *"This year we haven't got anywhere we can consider and evaluate our relationships with the families. The Funds of Knowledge meeting was the only time. Yes, we have the evaluation meetings, but then we talk more about the children than about their families. Then, if specific problems arise, the matter is presented to Coordination, but these tend to be one-off incidents."* [Coordinator_Interview_16.12.20].

In their weekly meetings the teaching staff do talk about relationships with families and the use of the app. However, these conversations are spontaneous and refer more to the content of the weekly messages, and do not constitute an intentional, planned reflection on their own practices, or their beliefs and prejudices about the families, the use of digital technology in this relationship, school ethnocentrism or power relations.

DISCUSSION

Our study has afforded us a glimpse at 5 months of use of a technological platform in a school belonging to a low-income social environment, with students belonging to minoritized groups, in a context of restrictions produced by the pandemic. The results allow us to reflect on the potential and limitations of this type of tool in the development of relationships between school and families.

First, the results indicate that there is a need for convergence between the use of these devices and face-to-face encounters. During lockdown, the children's needs for attention and affection were the most important factor, and digital support (especially for families whose situation is precarious) is still inadequate as a means of mediating relationships with a strong emotional component. This deficiency has led to technologies necessarily being complemented by opportunities for face-to-face meeting, which continues to be the priority for affective communication. Our results highlight the reality of a convergence between face-to-face meetings (even if only fleeting exchanges at the school gates) and the use of the mobile app. This mixed construction of school-family interactions seems to follow the same trend as that of teacher-student educational interactions, in line with the hybrid education model (Pardo and Cobo, 2020), who call for the traditional architectural barriers between presential and virtual education to be overcome. Digital devices offer great potential for the expression of feelings, which could undoubtedly be developed in tools like the app mobile to expand the range of interactions provided. Nevertheless, it seems that the ultimate meaning of these interactions is still constructed via physical encounters, suggesting we should continue to reinforce the complementarity between digital uses and face-to-face encounters in the construction of relationships, and not neglect their emotional basis.

The most interesting finding in relation to the potential of the new tools is their *multimodality*. The use of images and videos in the app produces a qualitative change in the messages exchanged between the school and the families, by introducing "fragments of life." Prior to the pandemic, family-school relationships were mediated by the normative use of printed communications and the punitive one of appointments to resolve conflicts or to discuss shortcomings. With the novel situation and the use of the mobile app, this relationship has been transformed into a dialogue on everyday experience, with the child as an active protagonist. Interestingly, this medium reveals the inadequacy of certain formal uses of language that are alien to the families' habitual forms of expression. Multimodality, on the other hand, seems to be more attuned to everyday discourse, in which words are contextualized by images and activities. The main limitation observed in this respect is that the app is used almost exclusively at the initiative of the school, as the initiator or explicit requestor of the exchange.

Another important potential of digital platforms is the possibility of increasing the agency of families through the creation of shared content. New possibilities have arisen, but to date there has been very little development in this area. A virtual space enabling content creation by families would promote the legitimation of their knowledge, as is intended with the Funds of Knowledge approach (González and Moll, 2002; Hogg, 2011; Esteban-Guitart et al., 2019), but, as discussed above, agency continues to reside mainly with the school, which still generates most digital content and defines the areas in which families may contribute. Digital devices, in theory, offer bidirectionality, but in practice this potential is largely unseen. In short, if there are few opportunities for families to share their socio-cultural practices, values, forms of relationship or socio-interactive repertoires with the school, this makes it difficult for the school to identify, value and legitimize these factors, incorporating them into classroom life and fostering continuity between the two contexts. Therefore, from the outset the families have been mere recipients, and not producers or agents of this change, and have had to accept the decisions made beforehand by the school.

The same "recipient" role is apparent in the use and content of the messages: the families receive the information that the teachers send, but in most cases they do not use the app to produce new content and share it with the school. Very probably, as the coordinator suggests, this is because they are overly prudent and do not believe it appropriate to share their own knowledge and practices. In addition, the fact that families can only address the teacher (and not each other) limits the

possible uses of this technology. The logic of mobile apps aimed at constructing social networks should allow these families to conduct group interactions, sharing their knowledge, ideas and activities, thus helping create a more open, democratic and participatory community. On the other hand, this is a complex process that poses dilemmas and risks and might generate some apprehension among the teachers.

Furthermore, it would be useful to analyze the role played by the children in mediating between the school and family contexts via technology, since they are the real protagonists in this relationship. From the teachers' observations, and our analysis of the messages sent via the app, it seems clear that the children are being left on the sidelines in this respect. Only when the parents read the messages together as a family are the children able to mediate in the process, by explaining the photographs showing the classroom activities.

To overcome these limitations, we have the great potential of mobile apps fostering *participation* and the configuration of communities of interest (Lacasa, 2020) and affinity spaces (Gee, 2013). In a context such as that of the school examined in this study, a suitable app could help generalize participation and enhance the development of community networks with digital support. On the other hand, this process might be obstructed by the formal dynamics of the school institution, weighed down by its established, legitimized unidirectionality as a repository of normative knowledge. Moreover, the configuration of the digital device as a mechanism that places the school at the center of attention, connecting it with the families on the periphery and excluding any kind of *horizontal* interaction, impedes the creation of the kind of community found in other social networks.

Another potential of the telematic devices is the *distribution of knowledge*. This attribute meshes perfectly with one of the goals of the Funds of Knowledge approach, namely to foster the construction of a meeting space between the school's knowledge and that of the families. The mobile app provides an opportunity to digitally re-create this space, to nourish it with contributions from the school, to provide a showcase for the children's activities, to lend them meaning and to include contributions from the families, thus legitimizing the domestic practices that guide the children's development. The strategies discussed above reveal potential avenues to explore in this direction, but also highlight the great distance remaining to be covered and the limitations of the digital apps currently available. In our opinion, three important lines need to be developed.

Firstly, in line with the Funds of Knowledge study group (Esteban-Guitart et al., 2018), teachers could collectively and critically evaluate the use of the tool within the framework of strategies to develop new forms of school-family relationships. In addition, they should consider issues such as the attitudes taken toward families, ethnocentrism, power relations, channels of communication and the uses of technology in this respect. Indeed, this process is already under way, within the framework of the Funds of Knowledge approach (Zhang-Yu et al., in press). The mobile app, as a mediating device, transforms activities, but the conscious definition of the goals motivating these activities is what actually regulates the directions taken in this transformation.

Secondly, as we have seen, this digital-driven communication must become truly bi-directional, to transform it from a medium by which information flows primarily from the school to the families to one in which both directions are active. Meeting this challenge, however, will require imagination and dialogue. Furthermore, the very architecture of the tool can facilitate or limit the flows. Therefore, we need to consider the possibility (which has already been accomplished, technologically, in social networks) of achieving horizontal communication between families, and thus exploiting the potential offered for concerted, collaborative action. This advance would also give families a voice in how technology is used in their relationships with the school.

Finally, students must become actively involved in family-school mediation. Their appropriation of digital technologies would accompany that of the motives and goals of school practice, granting them agency in promoting educational continuity between these two contexts.

However, some study limitations should be noted when considering these conclusions. Since it is a case analysis, results describe a contextualized and concrete reality and cannot be generalized. Besides, data categorization is not objectively replicable. Thus, the above proposals should only be considered the starting point for future action taking into account the experience described, our analysis of the situation and the suggestions made for improvement, from our discussions with the teachers involved. This account, therefore, represents the conclusion of one stage of the process and, at the same time, an introduction to new spaces for reflection, new challenges to be addressed and lessons to be learned. With this study, we hope to have contributed to a greater understanding of the school-family relationship during a period in which social inequalities have been exacerbated. The pandemic has spurred us to re-examine the ways in which schools and families interrelate and communicate, but further research and fresh thinking are undoubtedly necessary to meet the present and future challenges to our society.

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 Research Ethics and Biosafety Commitee (CEBRUdG) Universitat de Girona. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

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

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Critical Analysis of the Risks in the Use of the Internet and Social Networks in Childhood and Adolescence

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Kids are people who consume content on the Internet very frequently and actively participate in social networks, so it is necessary to know the risks of their use by children and adolescents, in order to propose a critical analysis of them. This work is the result of two research studies: a qualitative and a quantitative analysis of 1,350 children and adolescents between 6 and 12 years old living in Spain. The objectives of this paper are analysing the attitudes of children and adolescents about the safe use of the Internet and social networks, studying the differences in the discourse of children and adults about the risks of their use, as well as defining areas for improvement to promote the safe use of the Internet and social networks. The main findings include intergenerational tensions between adults and children in the use of the Internet, the difficulty of reaching consensus and quality support when using the Internet. Children have transcended the physical and digital space considering it, so they must be given the tools, competences and security to fully develop their digital identity.

Keywords: childhood, adolescence, online risks, internet, social networks

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INTRODUCTION

The health pandemic we are experiencing has changed many of our routines and consumption habits, whether due to the more or less strict lockdowns or the recommendations that we must all adopt. Children have not been an alien part of this context, but rather one more actor with unmet needs and great deficiencies (Núñez-Gómez et al., 2021). During the severe lockdowns in different countries all around the world, mobile devices have been, for many kids, their only means of socialising with their peers and entertainment, but also their learning tool to be able to follow classes (Ghungrud et al., 2021).

If the use of mobile devices has been increasing in recent years, in Spain, as a result of COVID-19, the time spent using mobile phones increased by 38% and WhatsApp by 61% (Ditrendia, 2020). These figures are in line with the academic community's growing interest in researching the uses, risks, threats and opportunities for children and, in particular, the so-called Alpha Generation (McCrindle, 2014). In this regard, we find literature from more than a decade ago by Livingstone, Ponte, Staksrud, and Núñez-Gómez (Staksrud et al., 2013; Livingstone et al., 2018; Livingstone and Blum-Ross, 2020; Núñez-Gómez et al., 2020; Livingstone and Stoilova, 2021). The studies by

Kids Online, Global Kids Online, Common Sense Media, DigiLitEY Action, the work of ECREA and SIC-Spain, among others, are also a reference. In this regard, the latest study published by AIMC Niñ@s (AIMC, 2019) in Spain and carried out on children aged between 3 and 13, shows that they use an average of 4.1 devices at home, with their favourites being the smartphone, tablet, television and video console. In addition, the study shows that 39% of the children interviewed own a tablet and 27.1% own a smartphone. In terms of screen exposure, children up to 12 years old spend an average of 5 h a day in front of a screen.

According to recent studies (Núñez-Gómez et al., 2021), the Alpha Generation has a holistic experience with technology without making distinctions between formats and devices since, like adults, they do not consume in isolation. Kids under 8 years old see the Internet as a tool for entertainment and especially YouTube, which has a larger audience than many TV channels combined. In this sense, children under 12 years old love watching YouTube content produced by other peers (McRoberts et al., 2016; Yarosh et al., 2016). The use and consumption of smart screens is one of our children's favourite activities, with a relationship directly proportional to their age (Ortega-Mohedano and Pinto-Hernández, 2021).

The consumption of mobile devices is also associated with pathologies related to obesity and sedentary lifestyles (Borzekowski, 2014; Hoge et al., 2017; Kenney and Gortmaker, 2017; Robinson et al., 2017; Goodyear et al., 2018) or with other risks such as digital and physical bullying, sexting or contact with strangers (Garmendia et al., 2018; EU Kids Online, 2020). We are also facing "dangers that may be difficult to locate [such as] access to inappropriate content; uses of technology that expose the privacy and intimacy of kids to the eyes of friends and strangers" (Sádaba and Bringué, 2010, p. 88). In fact, the perception of risks differs considerably depending on the age of the children. For example, children aged 3–5 years are not aware of risks; while children aged 6–9 years have a strong desire for immediate reward, which makes them take risks (Bond and Rawlings, 2018). The EU Kids Online study (2020) highlights the following risks: excessive Internet consumption, viewing images with sexual content, sexting [receiving messages with sexual content], viewing potentially harmful user-generated content, online aggression, and cyberbullying. In channelling, detecting and solving risks, most experts agree on the decisive role of family, school and administration in making and guaranteeing a "responsible, safe, and fruitful use of technology" (Sádaba and Bringué, 2010, p. 103). Livingstone and Stoilova (2021) have recently updated the classification of online risks, taking into account whether children are related to or exposed to harmful content; whether they experience or are identified by potentially harmful contact; whether they witness/participate in and/or are victims of potentially harmful content; or whether they are party to and/or exploited by a potentially harmful contract. The mentioned classification also distinguishes between aggressive, sexual and value risks, as well as cross-cutting risks related to privacy, health and fair treatment.

Online games also have their risks. They have a negative image compared to other games (Morales, 2009) because of the addiction they generate and because they lead to diseases such as IGD (Internet Game Disorder) in some cases (Gil et al., 2020). On the other hand, online games that allow numerous players to play at the same time (Massively Multiplayer Online Role-Player Games - MMORPGs) have become very popular among young people. This type of games requires players to invest many hours, which has led to addiction problems, especially for those players who use the game as an escape from reality (Kuss et al., 2012). However, it also allows them to make friends with strangers who are playing at the same time, something that occurs mainly in boys than in girls (Bond and Rawlings, 2018). These types of games are also associated with an addiction to screens by younger children, those effects have been called "electronic cocaine" or "digital heroin" (Kardaras, 2016). Many MMORPGs are characterised by online tracking of players' sessions [referring to the process of recording, measuring and analysing people's behaviour when they browse the Internet]. The game owner can monitor when, how and with whom the game is played and, depending on the device used, the player's location, images, facial data, the use of other applications or health information can also be accessed (Corcoran and Costache, 2018). Among other things, this information will be used to make business decisions, to create consumer profiles or behavioural trends. Furthermore, Vlajic et al. (2018) argue that this type of tracking, in terms of user privacy, can be considered a major risk, because it could lead to the extraction and leakage of sensitive personal data. But it is also related to other ethical issues such as weblining [a practise that makes a user ineligible for certain goods and services based on their online profile] because, although today there is the possibility of creating anonymous avatars, with the increasing development of technology, it is very likely that, in the future, the anonymous digital avatar can be linked to the real person and their real-life transactions (Corcoran and Costache, 2018).

Privacy breaches are another risk associated with Information and Communication Technologies -ICTs (EU Kids Online, 2020). Children have difficulty understanding what privacy entails, they know little about cookies to track users and, in most cases, do not understand why personal data should not be given out, which is of particular concern to parents (Watson, 2021). In fact, it is known that children are more likely to give their personal data if they are offered a prize or reward than an adult or a teenager. In this regard, research carried out by Madden et al. (2013) suggests that adolescents are increasingly aware of what privacy entails and choose not to download certain apps when asked for personal data. On the other hand, Hernández and Ebersole (2021) highlight the different views of privacy held by children and their parents. This is compounded by the fact that children pay little, if any, attention to privacy policies and lack of understanding of the legal and economic concepts explained in them. In this regard, the UN is working to develop a General Comment on Children's Rights and the Digital Environment recognising children's rights in the digital sphere (Livingstone and Stoilova, 2021).

As for social networks, although the legal age for accessing these platforms is between 13 and 14 years old, millions of children under this age enjoy these services (Gaptain, 2020). Beyond the pandemic, in the case of Spain, the latest studies

reveal that children between 9 and 16 years old consult social networks every day or very often (EU Kids Online, 2020), in primary school (Gaptain, 2020) they change their date of birth to be able to have a profile on social networks and follow influencers on preferred social networks such as TikTok, Instagram, YouTube or Twitch, while in secondary school they begin to have three types of profiles on social networks: one for the family, another one to search anonymously and freely express their opinions and the third one to spy. In this sense, according to Gaptain (2020), social networks are co-educating children through the influencers they follow, something that makes their fathers, mothers and teachers to stop being references as they become digitalized, and a turning point where the digital divide and tensions between adults and children begin to take shape.

Given that the Internet and social networks have become a place of socialisation for children and adolescents (Núñez-Gómez et al., 2020), it is necessary to propose a critical analysis that allows for the creation of a consensus on use of the Internet between children and adults. Such a consensus will only be possible in an environment of trust and mutual responsibility is built, something that does not exist today. Hence, the hypothesis of this work is that there are tensions between the preconceived ideas between adults and kids about the use of Internet and social networks by childhood and adolescence, and the demands of children and adolescents about their experience of use. Hence, the objectives of this study are as follows:

- To analyse attitudes among children and adolescents about the safe use of digital services and products.
- To study the differences between children's and adults' discourse related to risks in the use of the Internet and social networks.
- Define areas for improvement to promote safe and consensual use of the Internet and social networks.

The novelty of this work lies in responding to the need to lay the foundations for building consensus on the use of the Internet and social networks between adults and children. Children and adolescents need to be equipped with the necessary skills, competences and safety so that they can develop as responsible adults in all their facets, including the digital one. To achieve this, it is necessary to transform the current imposition of rules on the use of the Internet and social networks into commitments agreed by adults and children that promote the safe use of digital tools.

METHODOLOGY

The complexity of analysing the reality of childhood and adolescence requires the design of research procedures that allow for an accurate approach. It is easy to fall into common places, into preconceived and idealised visions of what it is to be a child, into giving meaning to certain concepts, and into adult social representations of childhood and adolescence. Social representations establish an order in the social domain, a code, a named classification of reality, and an oriented social communication (Moscovici, 1979).

This article is presented as the result of two studies, a qualitative one to find out children's opinions on their attitudes toward the safe use of the Internet in childhood and adolescence. And another quantitative reseach, which consisted of applying a survey to children between 6 and 12 years old, to measure the use of devices and Apps in childhood and adolescence. Circumstantially, the start of the fieldwork for both studies coincided with the declaration of the pandemic due to the global health crisis caused by SARS-CoV-2. This circumstance meant that the application of the research methods selected a priori in the research design had to be adapted due to the impossibility of applying the techniques in person, and the reason for conducting the interviews (individual and group) through digital communication platforms.

For the study of social representations regarding the risks of using ICTs in childhood and adolescence, it is a requirement to apply methodologies for the identification of the elements that constitute the representations and their hierarchical organisation, as well as for the concretion and determination of the central nucleus or nuclei of these representations (Abric, 2001).

The fieldwork for the qualitative study was carried out between February and July 2020, with 16 interviews with a selected sample of experts (key informants), distributed around 6 thematic blocks: awareness, Internet hoaxes, viral challenges, influencer phenomenon, video games, and sports betting. Several field notebooks have been completed with annotations based on the observations of the adolescent co-researchers in the study. The group of co-researchers consisted of six adolescent research assistants.

The selection of key informants was based on the criteria of having a diversified sample that included different perspectives from the public, private, academic, and organised civil society spheres (**Table 1**). The sample included representatives from international technology companies, the Spanish State Attorney General's Office, the Guardia Civil's Telematic Crimes Group, various officials from Spanish Ministries, experts from several Spanish universities, representatives from third sector organisations, and a representative from the National Institute of Cybersecurity (INCIBE).

The adolescents participating in the group interviews belonged to several municipal participation groups of the Platform for Childhood in Spain (**Table 2**). They participated in six group interviews, each of which was linked to the thematic monographs addressed in the fieldwork.

Thus, in order to analyse the risks of ICTs use by children, a qualitative study design based on Grounded Theory (Glaser and Strauss, 1967) was applied in the first phase. Above all, as it is a methodological proposal that is adjusted to the analysis of social representations for the definition of concepts as well as their properties and dimensions, and the integration of categories and subcategories into conceptual schemes. For the analysis based on Grounded Theory, Atlas.ti 9 software was used for developing the foundations of deduced, induced, and emerging categories.

Ideas and opinions in relation to the six selected thematic blocks were analysed with the collaboration of the mentioned team of adolescent co-researchers called the Gadget team. The Gadget team provided feedback during different consultation

TABLE 1 | Sample of experts by sector.

Sectors	Academy	Public administration	Private company	NGO	Total
Communication/Internet			2		2
FMCG				1	1
Security forces		1			1
Education		2	2		4
Research	3			2	5
Judicial		1	1		2
Digital leisure			1		1
Total	3	4	6	3	**16**

Source: prepared by the authors.

TABLE 2 | Sample of adolescents.

Groups	Girls	Boys	Total
Caje	2	1	3
Molina	2		2
Salamander	3		3
Gadget	3	1	4
Total	10	2	**12**

Source: prepared by the authors.

processes on the objectives of the study, the topics to be explored, the questions to ask adults and adolescents, and contributed to the interpretation of the results and the drawing of conclusions.

To consolidate the data obtained in the qualitative analysis, a second quantitative analysis was carried out through a survey on the expectations and habits of use of mobile devices and their Apps by children between 6 and 12 years old, which was conducted after the SARS- CoV-2 confinement in Spain. A self-administered questionnaire with a total of 36 questions, validated and pre-tested beforehand, was applied. At the same time, and prior to the fieldwork, an analysis of the most relevant publications of studies and research related to the object of study was carried out. The fieldwork was carried out from 23 November to 9 December 2020, with a sample of 1,350 boys and girls in the population of children aged 6–12 years in Spain. The distribution, monitoring, and follow-up of the survey was carried out through a research platform. A total of 675 surveys were administered to children between 6 and 9 years old and another 675 surveys to children betwen 10 and 12 years old. In order to be included in the study sample, the children surveyed had to be regular users of a smartphone and/or tablet, and for ethical reasons they had to have the authorisation and/or supervision of their parents and/or guardian when answering the questionnaire. Statistical processing of the data was carried out using SPSS software (version 25).

For this study, random sampling was carried out in cities with more than 10,000 inhabitants in Spain and by quotas of age, sex, region of residence, educational centre, and income received. Children from all the Autonomous Communities in Spain participated in this study.

RESULTS

The results of the qualitative study on attitudes toward the safe use of the Internet and social networks in childhood and adolescence are presented below, basing these results on the evidence obtained from the application of the survey on the use of devices and Apps by children.

As indicated in the chapter on methodology, a Grounded Theory analysis was carried out in order to address the type of adult representations on the type of use children make of ICTs. In order to carry out this analysis, an open coding of categories and subcategories was carried out from the interviews with adult experts, and from the ones with children and adolescents. The mentioned process resulted in the coding of 119 emerging categories in the case of the interviews with adults, and another 91 induced categories from the interviews with children and adolescents. The analysis procedure continued with the generation of an axial coding matrix that relates categories and subcategories linkable to indicated and induced phenomena from the interviews, as well as the stipulation of conditions, actions and consequences of these phenomena. In this way, the categories that provided a greater degree of explanation of the phenomena analysed according to the qualitative data from the fieldwork were verified. Furthermore, the explanatory value of these categories was double-checked by comparing the discourses of the adult informants and the adolescent informants.

From the selective coding, a number of central themes stand out that present contrasts between adult and children's discourse, as can be seen in the following **Table 3**.

The main results of the quantitative analysis are detailed below, starting with children's assessment of Internet use.

If we look at the ratings with the highest degree of agreement in **Figure 1**, we can begin to foresee possible factors to be highlighted with the aggregate responses of "agree" and "strongly agree," such as: "entertainment" with 87.9% of responses, "rules of use" and "parental control" with 86.4% and 80.5% of responses respectively, all issues linked to "education," "learning," specifically the use of the Internet at school and its importance for learning, with 78.4 and 78.1% of agreement on its importance, respectively. In addition, the importance given to reflection and expression of ideas and feelings is noteworthy, with 75.8 and 62.6% of the children in the sample indicating that they agree and

TABLE 3 | Central themes.

Central themes	
THEME 1	ACCESS TO INFORMATION
Central categories	Quality product design
	Critical thinking
	Internet access restriction
THEME 2	DIGITAL CITIZENSHIP
Central categories	Digital emancipation
	Opinion in childhood
	Digital socialisation
THEME 3	DIGITAL SKILLS
Central categories	Informal peer learning
	Active methodology and teacher training
	Awareness
THEME 4	CHILDREN'S SOCIAL SPACES
Central categories	Adult accompaniment
	Generating and accepting standards
	Child protagonism
THEME 5	LEGISLATION
Central categories	Legislative implementation
THEME 6	DIGITAL RIGHTS
Central categories	Entertainment/Leisure
	Exclusion from the digital environment
	Limitation of rights and freedoms
TOPIC 7	DIGITAL CULTURE
Central categories	Digital content creation
	Children's consumer rights
	Influence in social networks
THEME 8	RISKS IN THE DIGITAL ENVIRONMENT
Central categories	Addiction
	Anonymity
	Parental control
	Limitation of usage time
	Parental/peer mediation
	Generational use

Selective coding of the analysis based on grounded theory.
Source: prepared by the authors.

strongly agree with these issues. Among other issues, the singular valuation of advertising on the Internet stands out, especially when assessing the amount of advertising they see. In this sense, 67.9% of children say that they see too many advertisements when they use digital products and services. In addition, 38.9% of children say that they see advertisements that they consider harmful to their development.

On the other hand, there is disagreement on other issues. Adding the responses "strongly disagree" and "disagree," 54.5% of children say that they do not feel unsafe using the Internet, and 46.3% of children say that they do not agree that they spend many hours a day connected to the Internet.

To consolidate the analysis of children's assessment of their use of the Internet, data from a factor analysis using principal component reduction is presented. As a result of the analysis, five principal components are obtained. **Table 4** shows the results obtained with the names of the principal components.

In the procedure for extracting the latent dimensions that underpin the children's valuation of the Internet, the variable "time spent connected to the Internet" explains a very small percentage of the variance, exactly 1.99%, and is not considered in any of the principal components calculated. It is only a factor that acquires greater relevance in Component 4: Quality digital consumption, exactly in relation to the impact of advertising in the digital ecosystem and the use of digital platforms. It is necessary to pay attention to this issue as it is a key indicator in most analyses of ICTs use among children and adolescents. In any case, this issue is prioritised in order to support, along with other factors and considerations, the possible "addiction syndrome" to ICTs among children.

In the detail of the dimensions considered, we proceed to group the variables corresponding to each main component, obtaining as a result the degree of valuations given by the children in the sample to each component.

The importance given by children to the component called "rules of use" (88.7% of children give this component a "high" and "very high" importance), "learning" (87.4% give it a "high" and "very high" rating) and "socialisation" (63.2%) stands out in **Figure 2**.

The number of preferred digital activities identified by the children surveyed is significant, a total of 55. Although many of these digital activities are associated with a low percentage in the preferred selection, it should be taken into account that this information was obtained through open and spontaneous responses in the questionnaire applied in the survey. The diversity of digital activities, i.e., those that can be carried out through the use of different devices, should be taken into consideration when answering the question on the time spent by children using ICTs. In this sense, the following results are relevant: (i) the different types of use that each device may have; (ii) the number of activities related to the dimensions of socialisation and learning; (iii) the role that these devices and Apps acquire for interlocution and accompaniment; (iv) and that they are devices not only to facilitate the carrying out of activities but can also be a way of being in the world and being with others in the world.

It is worth noting, as mentioned above, the importance of those digital activities linked to entertainment and social relations, and therefore included in the "socialisation" dimension, and those related to learning and access to and management of information, which are included in the "learning" dimension (**Table 5**).

Table 6 presents the relationships established in this study between the central themes obtained from the application of Grounded Theory analysis in the qualitative study and the principal components resulting from the application of a factor

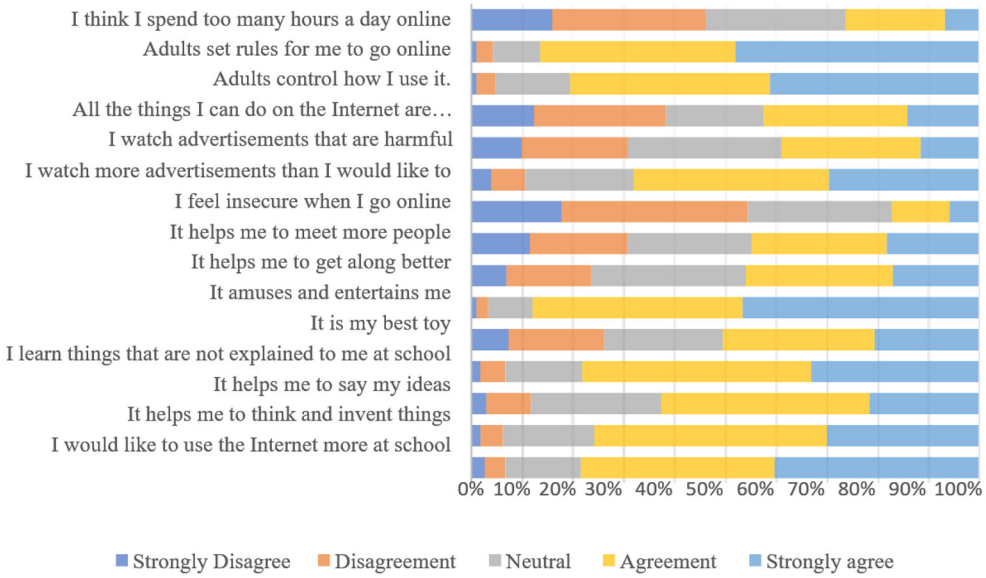

FIGURE 1 | Evaluation of internet use (%). Children aged 6–12. Source: prepared by the authors.

TABLE 4 | Latent categories.

Latent dimensions	
Component 1	Socialisation
Variables:	*It helps me to speak my mind*
	It's my best toy
	It helps me to relate better
	It helps me to get to know more people
Component 2	Learning
Variables:	*I would like to use the Internet more at school*
	It helps me to think and invent things
	It helps me to speak my mind
	I learn things that are not explained to me at school
Component 3	Internet usage rules
Variables:	*Adults control me a lot about how I use it*
	Adults set rules for me to log on
Component 4	Quality digital consumption
Variables:	*I see more advertisements than I would like to*
	I see advertisements that are harmful to children
Component 5	Safety in the use of digital products/services
Variables:	*I feel insecure when I go online*
	All the things I can do on the Internet are free of charge

Principal component reduction.
Source: prepared by the authors.

analysis with the data obtained from the children's survey. It has been verified which principal components were related on the basis of the categories and subcategories obtained in the Grounded Theory analysis, with the principal components.

Based on the principal components obtained in the factor analysis of the survey data, the main results are presented below.

Internet usage rules:

- The adults interviewed give importance to the regulatory development in Spain and, at the same time, the deficit at the regulatory level in relation to the digital environment. On the other hand, the adolescents who took part in the research, although they did not explicitly mention legal or juridical issues, requested and demanded the recognition of their rights regarding regulations that have an impact on their daily lives. The need to reach agreements between children and adults in the generation of rules that affect their daily lives stands out. In this way, rules that are not decided and agreed between adults and children and adolescents become non-rules or imposed rules that are easy not to comply with.
- Although children are demanding their position as valid interlocutors in the processes of social interaction in all spheres and spaces, including in the cyberspace, there is still a clear opposition that corresponds to an adult imaginary in favour of limiting and restricting access to the Internet as the main strategy.
- Despite the tensions in being able to inhabit the different social spaces, the adolescent informants in the study requested and demanded the accompaniment of adults, albeit with conditions on the ways of generating and accepting the rules to be agreed upon, the latter being the main key.
- Children asked for a higher quality of adult accompaniment, and a necessary intergenerational trust between adults and children. When assessing children's attitudes in the use of ICTs, the lack of intergenerational agreements has been a generalised comment, as well as the social stigma on children due to the underestimation of their competences and

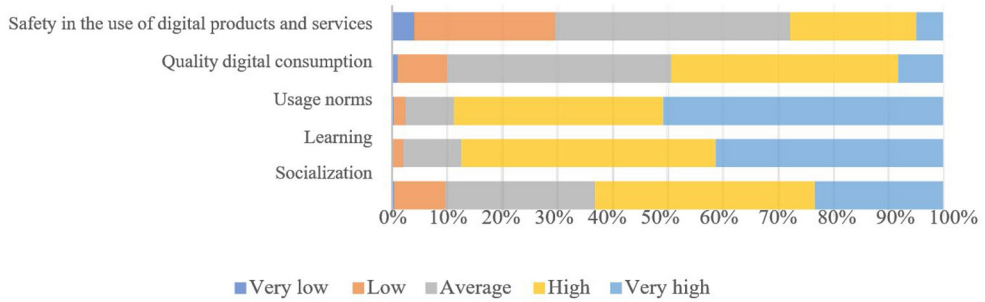

FIGURE 2 | Evaluation of internet use. Main components (%). Boys and girls aged 6–12. Source: prepared by the authors.

TABLE 5 | Favourite activities with devices (grouped) (%).

Grouped activities	Smartphone	Tablet	Voice assistant
Access to and management of information	4,4	3,2	30,8
Learning	3,7	9,2	6,8
Editing and audiovisual communication	5,8	4,7	0,4
Entertainment	54,9	65,6	42,3
Artistic expression	1,1	4,5	0,2
Social relations	28,6	9,2	2,1
Use of other digital products/services	1,2	0,5	7,2
NS/NC	0,4	3,0	10,2

Boys and girls aged 6–12.
Source: prepared by the authors.

TABLE 6 | Relationships established between core themes and principal components based on grounded theory analysis.

Central themes	Main components				
	Socialisation	Learning	Standards	Quality consumption	Security
Access to information			X	X	X
Digital citizenship	X	X	X		
Digital skills		X	X		X
Children's social spaces	X		X		
Legislation			X		
Digital rights	X		X		X
Digital culture	X			X	
Risks in the digital environment		X	X		X

Source: prepared by the authors.

aptitudes. It seems important to recognise the trust in children in order to establish partnerships between generations.

Learning:

- Both children and adults agree on the importance of acquiring digital skills, as ICT have a significant impact on daily lives. However, they differ in the availability and mobilisation of digital resources, in the topics of key issues affecting every day because of the use of ICTs, in the absence of a valid adult dialogue, and in the lack of real meeting places for this dialogue. Thus, the Spanish teenagers who took part in the study highlighted both the lack of digital workshops at educational centres, as well as the limited impact of changes and technological transformation in the classroom and therefore in the educational methodology.
- The main debate that is established about access to information corresponds to the degree of capacity and incompetence of children in the view of adults, giving a lower value to digital experiences and experiences acquired at any age.

- Adolescents demand quotas of responsibility, above all linked to empowerment in decision-making, and adult accompaniment, but based on agreement and respect for consensual rules.

Socialisation:

- The virtual environment is made up of digital social spaces where habits, values and attitudes are formed. There is a difference between digital habits and healthy habits, the former being acquired in the digital environment in relation to digital phenomena, and the latter referring to a framework and process of controlled learning of healthy digital habits.
- There is tension over the designation of territories in childhood and adolescence due to the social spaces they must inhabit. The preferred territory for children and adolescents today is cyberspace, where they develop a sense of identity and generation. In cyberspace, children strengthen their group and generational identity (for example, the importance that the movement against climate change has acquired among children and adolescents is notorious). But if for them cyberspace is the "place," for most adults it is the "non-place" in childhood and adolescence.
- Among the adult population, there is an undervaluation of rights linked to freedom of expression or access to information, and more specifically with aspects that the adolescent informants who participated in the research consider relevant in their daily lives, such as the right to play and to enjoy their free time on the Internet.

Quality Consumption:

- There is a correspondence between the discourse of adults and children regarding the poor quality of digital content. The adolescent key informants in the study suggest as a necessary strategy the control of the design of digital products and therefore of the services through which they are offered.
- Digital culture is permeated by phenomena linked to the products and services of the digital ecosystem. The participating children have expressed their reticence about the control of digital companies over their data, the ways of using Apps, and the time spent using products and services that are designed to captivate the user. In addition, they point to the importance of peer pressure on the type of ICT use and intensity of use. On the other hand, for adults there are too many digital phenomena: influencers, viral challenges, online sports betting, etc., which are obvious risks for children because of their presumed low skills and incompetence.

Safety in the use of digital products and services:

- Adults interviewed in the study highlighted the need to limit certain civil rights of children justified by the need to prioritise other fundamental rights, essentially those linked to social and child protection rights.
- There are different types of risk and as such they are analysed and studied, to which are added gradients of greater or lesser probability of being able to suffer threats due to conditions and factors of a social and individual nature. When assessing issues related to risks on the Internet and social networks, adults consider necessary to treat children as subjects of special vulnerability. The children participating in the study are aware of the vulnerability of children and adolescents in the use of ICTs, but they also extended those risks to the rest of the generations, especially due to the conditions of use of digital products and services specifically designed to captivate the user, and the vulnerability of any user due to a key factor: the low level of digital skills of most of the population in a rapidly changing digital ecosystem. A collectivised strategy to deal with risks and threats on the Internet seems necessary.

DISCUSSION

Although the health pandemic has accelerated some trends that had already been noted in relation to the use of the Internet and social networks by children and adolescents, children's consumption of the Internet has doubled in recent years (EU Kids Online, 2020). Much of the content that was previously consumed on traditional channels is now consumed online, which is why YouTube is one of the platforms with the largest audience (Tur-Viñes et al., 2018). In fact, the consumption of content via the Internet and social networks is one of the favourite activities of children and adolescents (Ortega-Mohedano and Pinto-Hernández, 2021). In Spain, children connect to social networks every day (EU Kids Online, 2020) and even have different profiles in order to navigate with different identities (Gaptain, 2020). Therefore, it can be considered that the Internet and social networks have become a medium that allows children and adolescents to socialise (Núñez-Gómez et al., 2020). In addition to socialisation and entertainment, children are co-educating (Gaptain, 2020) themselves on the Internet and social networks, which means that the intergenerational digital divide between adults and children is growing, as well as the tensions it causes.

The particularity of the current research referred is that children have been given a status and position that is expressly significant both in the consultation on concepts related to the use and consumption of digital products and services and in their co-participation in the different phases of the research. In this way, it has allowed us to identify and analyse which ideas and categories are under tension and what are the potential factors of this tension at the intergenerational level. In other words, we can confirm the hypothesis of this work given that there are indeed tensions between the preconceived ideas among the adult population about the use of the Internet in childhood and adolescence, and the demands of children and adolescents about their experience of use. Hence, in terms of the objective related to analysing attitudes in childhood and adolescence about the safe use of digital services and products, we can conclude that there are numerous intergenerational tensions between the adult population and children. Firstly, there is a very tense central core due to adult conceptions of children's incapacity in terms of judgement and understanding, as well as moral incapacity. This issue affects a fundamental right such as access to information and freedom of expression. The empowerment of children is

directly related to the exercise of citizenship, especially if a higher level of emancipation is required for decision-making and the achievement of intergenerational consensus in the generation of rules on the use of devices and Apps. This tension is intensified due to the difficulty of finding meeting points in relation to interests and concerns, in many cases common, and in social spaces where conversations between both population groups could be generated.

From the objective related to studying the differences between the discourse of children and adults linked to risks in the use of the Internet and social networks, the work has shown that children and adolescents have surpassed and gone beyond the threshold of traditional spaces and territories in childhood and adolescence, such as the family and school, and are situated in territories that are less controllable by adults, generating an extended conflict. The new places and territories generated by the use of the Internet extend and magnify the discourses and clichés about childhood and adolescence, understood as social constructs based on adult representation and generational order. In this way, the struggle over whether or not cyberspace should be considered an appropriate territory for children and adolescents is not resolved through restriction or strict control, but rather by considering children as valid interlocutors and subjects of rights in order to reach agreements in the formulation of rules on the use of the Internet. Children therefore demand greater appropriation of digital social spaces and social dialogue, especially where they can share with others a sense of belonging and a common construction of a way of experiencing their identity development. It can be inferred from the above that consensus is not easily generated between adults and children on the solutions provided in the face of risks on the Internet. Nor are alliances of support reached between generations to reduce the uncertainties recognised by all in the safe use of the Internet and social networks.

The tension between legitimised social representations on the safe use of the Internet and social networks by children and adolescents, and the latent and non-legitimised representations of children, requires a new social contract. A contract in which the demands of a collective, children and adolescents, who are asking to be part of the conversation and decision-making on issues that concern them, must be positivised. This contract must be based on mutualism, on an intergenerational collectivism (between adults and children) and on a generational collectivism that is involved in providing solutions to the challenge of security in the use of ICTs and in the common benefit of all groups and therefore individuals. Although it is not necessary to demonstrate the importance of theories of social representations for studies of this nature, it is evident that there are still prominent tensions between children and adults that emerge in the discourses of both social groups. Moreover, these conceptual and interpretative tensions relate to issues that are central both at the explanatory level, based on the qualitative data of this research, and in the importance of the categories, in many cases central, to which these generational tensions are linked.

In relation to the objective of defining areas for improvement in order to promote safer use of the Internet and social networks, the greatest challenge is to build real partnerships in order to reduce the recognised uncertainties in the safe use of the Internet and social networks. Above all, correcting and gradually reducing the powers and prerogatives attributed to adults in the shaping of the generational order. Therefore, it will be necessary to assess changes for intergenerational alliance and accompaniment on:

- Generate appropriate frameworks for trustworthiness and proportionality in the relationship between adults and children.
- Involve children and adolescents in the regulatory developments of the norms that concern them.
- Overcome social stigmas about child users of social networks and the Internet and their use of ICTs.
- Overcome a very deterministic view of childhood and adolescence related to the incapacitation of children's judgement, understanding and morality.
- The need for liberation and transformation of the representations held by both social groups (adults and children) in order to facilitate accompaniment as a major central category.
- Facilitate the whole set of repressed actions that exist because they are subject to collective imaginaries that each generation has of itself and of its own representation of social reality.
- Lack of appreciation and importance of issues on which there is consensus between adults and children and adolescents. There are clear consensuses, for example, the most notorious being the concern of both social groups about the risks on the Internet, or the need for mutual support for effective intergenerational accompaniment.
- The necessary increase in trust between adults and children as a necessary and initial step to support a discussion.
- The development and strengthening of generational awareness among children and adolescents and the visibility of citizenship in childhood and adolescence.
- Normalising children's agency in digital and other social spaces.
- Strengthening of accompanying partnerships to reduce recognised uncertainties in the safe use of the Internet and social networks.
- Correct and gradually reduce the powers and prerogatives attributed to adults in the shaping of a generational order.

Although it is true that, although the limitations of this work focus on a sample centred on one country and a specific number of children, the critical analysis of the risks in the use of the Internet and social networks in childhood and adolescence that this work presents provides us with great value in terms of how our society should work to tackle these risks. Today's ever-changing digital ecosystem requires us to acquire digital skills as a society even more intensely, and not just training aimed at children. We also need a globally agreed collective strategy to address risks and threats on the Internet that values

children's digital space and digital culture. In fact, the SARS-CoV-2 confinement has shown that the main use that children have made of devices and Apps has been focused on learning and entertainment, and that their parents and guardians have had to relax the rules, which shows that intergenerational consensus works and that it is necessary beyond exceptional moments such as those we are experiencing due to the health pandemic.

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.

AUTHOR CONTRIBUTIONS

PN-G and KPL were involved in the conceptualisation of the project and acquisition of data and analysis. PN-G, KPL, CR, and FO-M were involved in the interpretation of the data. All authors were involved in drafting and revising the work for intellectual content and approved the manuscript for publication.

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Digital Narratives During the Pandemic: TV Series, Social Media, and Conversations on the Internet

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The situation of lockdown experienced during the months from March to June 2020 changed the daily lives of people in Spain and their leisure circumstances. This study analyses the narrative representations that people construct when they watched streaming TV series, during the covid-19 pandemic. To access these representations, the Spanish texts that appear on the Internet are analysed, including social networks and other social media. The paper adopts quantitative approaches that use big data analysis complemented with other qualitative approaches and inspired by content and discourse analysis. Findings show that these narrative representations constructed through conversations are on three levels in which context is revealed: first, institutional and community; second, online or offline interpersonal relationships which mention people as facts or as aspirations of their daily lives; and third, personal lives in the reconstruction of the series, projected on the plot reconstruction and the identity of the actors.

Keywords: TV series, digital storytelling, transmedia, big data, discourse analysis, content analysis

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INTRODUCTION

The pandemic has changed the lives of people a little. Social media has not been extraneous to these changes and neither have the representations people construct of its contents (Negra, 2020; Ong and Negra, 2020). Furthermore, we live in a world of multimodal universes, particularly visual ones, which are increasingly immersed in bodily experiences (Thurlow et al., 2020). Psychology cannot ignore these changes, considering how context affects the narrative that people construct in entertainment situations, for example, related to television streaming and expressed through social networks (Fiske, 1987; Stein, 2015; Lacasa, 2020). These representations are recent objects of study that psychology cannot renounce (Jewitt et al., 2016; Nærland, 2018; Parks, 2020). To analyse mental representations present through discourse is a particularly relevant approach to sociocultural psychology (Bruner, 1986, 2002; Demuth et al., 2020).

This situation also demands innovative methodological approaches which seek to integrate different perspectives in digital (Dencik, 2020). Big data, enabling new approaches to data, represent an alternative (Grimm et al., 2017, January; Woo et al., 2020) to traditional approaches that analyse quantitative questionnaires obtained in field studies or experimental work. In addition, when big data is obtained through social networks, its analysis can be complemented with other qualitative techniques, either content studies (Serafini and Reid, 2019) or discourse (Gee, 2014), which will provide a deeper contextualised meaning.

Against this backdrop, the questions stemming from this research study were defined as:

1. What narrative representations do people construct, related to certain television series, that they watch in streaming, in times of pandemic, and express through digital texts? How is the pandemic situation revealed in these representations and expressions?
2. What methodological challenges are posed by the analysis of conversations in digital environments, combining macro and micro levels? How can big data analytics be complemented by others that rely on content or discourse analysis to examine the situated meaning of narratives?

To answer these issues, this study approaches TV series during the pandemic. Big and small data analyses are combined to examine the digital texts around four television series, during the period between 14th March and 15th June 2020. This period coincides with the strict lockdown situation in Spain.

In our view, the main contribution of this paper is twofold. First, it shows that the representations that people build from the information they receive from the media need to be interpreted in particular contexts. Particularly, in this article, the TV series people watch in streaming. Second, from a methodological perspective, strategies are offered to combine analysis approaches related to big and small data.

The rest of this document offers, firstly, the theoretical framework of the study, secondly, the methodology used, and thirdly, the results and discussion raised by the research questions.

THEORETICAL FRAMEWORK

Narrative, TV Series, and Situated Storytelling

Narrative has traditionally been the subject of psychology from multiple perspectives. Ryan (2010) relates it to cognitive psychology (Schaeffer, 2010) and experimental psychology (Stein and Trabasso, 1981). According to Bruner (1986, 2002) who represents a milestone from this perspective, the narrative is a way of thinking from which reality is interpreted. In this way, narrating is a way of constructing meanings. It cannot be separated from the culture or the discourse through which human beings communicate. Thus, stories are forms of narration that provide guides to speakers about how they can express themselves. In this paper, we delve into the stories that are built up from television. This requires an interdisciplinary approach in which socio-cultural psychology is enriched with other contributions, closely following the work of Ryan (2019), which explores narrative contexts related to digital communication.

Compared with the structural models of the traditional narrative, which tend towards abstraction by seeking universality (Barthes and Duisit, 1975; Genette, 1980; Greimas et al., 1990), situated storytelling imply forms of social interaction. Particularly, digital environments where personal expression is linked to dialogue (Ryan, 2005, 2007, 2019). This all happens within the framework of a community and the analyses must be supported in interdisciplinary frameworks which are linked to discourse analysis, to sociolinguistics, pragmatism, and especially psychology (Page and Thomas, 2011).

The TV series show stories that become situated storytelling, the meanings of which are generated in specific contexts such as social media. The social situation of those who are watching this TV series, impacts viewing and mobilises the significances which are specified into multiple representations. These may be expressed through discourse (Fiske, 1987; Hall, 1997). These digital and situated narratives are open, i.e., they have no final closure and are expressed through multimodal discourses (Bernhart and Urrows, 2019). Also, this trait may be understood in relation to the identity and personal presence in the narrative.

Preferences and motivations around a TV series involve individuals and communities (Hemphill et al., 2018). Added to this, relationships are established between online and offline contexts, because the narrative experience is an embodied experience. Our bodies are located in space, time, society, and culture. In other words, they are contingent to internal and external influences (Ensslin, 2011). This is what happens during the pandemic, when identity becomes an embodied reality in Internet (Boyd, 2008). Within this framework, the concept of participative discourses becomes highly relevant, where stories are built up from the contents of the media (Thornborrow, 2015). Narration is understood as an activity related to discourse within a framework of a participative culture where implicit and explicit norms are imposed. These help to shape the community and encourage the coexistence between experts and followers (Demuth et al., 2020).

Transmedia Television Stories

Referring to TV series, transmedia stories must be understood within the framework of the changes made by Internet and digital platforms in the media context. New ways of viewing series arise, summarised by the maxim of anywhere, anytime, any device (Combes and Glevarec, 2020). The traditional television and, with it, the shows which were introduced in the form of soap operas (Piñón, 2019) have been forced to redefine their nature, triggered by technological changes.

Probing into digital stories leads to talk of transmedia, a perspective which is based on dynamic storytelling (AnsGar, 2003). Furthermore, transmedia storytelling has been linked to a combination of tools which lead to prototypical aspects of the storytelling through new media and to those considered to be engagement strategies (Mittell, 2015; Thon, 2016).

Relationships between *transmedia narratology* and *transmedia storytelling* (Ryan, 1991, 2016; Passalacqua and Pianzola, 2011) are established beyond media. The term is becoming ever more popular through the works of Jenkins et al. (2006, 2017), and Jenkins (2010), in relation to contemporary culture. The media, which are the nuclei of the transmedia phenomenon are somewhat more than information channels, they are also a means of artistic expression.

The concept of transmedia has aroused interesting debates on the way in which people represent histories in the media: a good example of this is the debate published in the International Journal of Communication (Kavoori et al., 2017). This includes interviews with representatives of narratology, where they reflect

and debate the transmedia concept. It is worth pointing out the two positions here due to their relevance in this study. The first, insists that the construction of the transmedia stories are a process involving the participation of the audience to the contents offered by the media (Papacharissi et al., 2017). Many voices interact in the construction of texts, behind each of which they are able to hide their different identities and situations (Archakis and Tzanne, 2005; Larrain and Haye, 2019). The second, related to the viewpoint of Murray et al. (2017), is highly critical towards the version of the transmedia as a participatory narrative.

Interactive and Multimodal Stories

This study analysed how the stories were reconstructed through social media, using interaction processes between users, texts, and platforms. These social networks are the framework in which we contextualised the interactivity. Compared with traditional media they are characterised by three traits. First, they include content generated by users; second, they provide social interaction tools; third, they engage in commitment which are generate collaborations, multiple modes of participation and communities with shared values and goals (Chung and Yoo, 2008; Sloan and Quan-Haase, 2017).

Other studies (Page, 2010, 2012) have shown that, in this digital environment, stories are fragmented. Sometimes, they appear from other discourses and are outside of what has traditionally been considered storytelling. Researchers linked to linguistics, psychology, or socio-cultural anthropology refer through discourse to these disperse imaginary or figurative worlds (Holland et al., 1998), since the words make sense within the framework of the stories. These are storyworlds which are built up collectively, from the community framework (Page, 2012; Nærland, 2018; Sundet and Peteresen, 2020).

These discourses, developed through social networks, and from which imaginary worlds are collectively constructed were characterised by two traits in the works by Marie Laure Ryan: interactivity and multimodality (Ryan et al., 2017). Interactivity (Ryan, 2011, 2015) refers to digital stories using a metaphor. Particularly, the presence of different layers: (a) peripheral interactivity. The text maintains a unit of form and content at an interface level. In fact, it is a combination of fragmented stories; (b) interactivity affects the narrative discourse and not the presentation of the story. The materials are predetermined but presentation is dynamic; (c) interactivity creates variations in the predefined story. The user forms part of the world of the story and provides freedom of action. This is typical of videogames; and (d) the generation of the story in real time. At this level, the stories are not predetermined, but they are generated by data that come partly from the system and partly from the user. It may become clear that the layers follow a logical order from lesser to greater interactivity. From stage four, we try to find a meaning by analysing our data. Here, the concept of possible worlds begins to make sense (Ryan, 1991, 2006) because they are the representations which the people build from the story, as part of interactive systems.

The second concept proposed by Ryan et al. (2017) is that of multimodality, which occupies an essential place in communication through the computer (Page, 2010, 2012). Multimodality is also related to the theoretical models of socio-cultural psychology (Kress and Van Leeuwen, 2006; Kress, 2012). Modes are semiotic resources from which the significance is constructed and are highly varied. These resources may be gestures, sounds, images, or words (Jewitt et al., 2020; Thurlow et al., 2020). As for the construction of narratives, this implies that they are using many resources, beyond oral or written language, in any communicative setting. Participants in social networks create significances collectively using multimodal semiotic resources. Social semiotics is particularly of interest (Jewitt et al., 2016, 2020) because it emphasises the activity (agency) of the people who construct the significance in social contexts. Moreover, the systems are built up from social usage, and this is what happens when representations and imaginary worlds are created through social networks or other digital texts.

METHODOLOGICAL APPROACH

This project is based on the quantitative analysis of "big data," which are defined by four properties: volume, since they include terabytes or petabytes; speed, because they are obtained in real time and space; variety, in that they can be structured or unstructured; and comprehensiveness in the objective, since they capture the entire population and are generated continuously (Zikopoulos, 2012; Kitchin, 2014; Panda et al., 2018). In addition, qualitative analyses are carried out from the perspective of content analysis (Gee, 2014; Jones et al., 2015; Tannen et al., 2015; Zamith and Lewis, 2015; Armborst, 2017; Recuber, 2017). It is, therefore, a methodology in which complementary approximations are used (Paoletti et al., 2021).

This research analyses the construction of digital stories relating to a selection of television series interacting with mobile devices. Digital texts, related to TV series, were collected during the period between 14th March and 15th June 2020. This period coincided with the situation of strict lockdown in Spain. For this we have used a specific software big data analysis. Conversational analysis software that performs content are based on two possible strategies, which are used interchangeably across different analysis processes: (1) the presence and absence of certain linguistic terms; (2) the semantic meaning generated by the software. It should be noted that the software also allows access to the original source at any time, something that makes it easier for the researcher to go beyond big data and carry out qualitative discourse analysis processes that seek meaning through interpretations.

The Selected Series

To select the series, a questionnaire was created through a Google template, to which 110 young people aged between 18 and 23 responded. The questionnaire was conducted in the months of January and February 2020 before the unforeseen confinement occurred which, in Spain, began on March 14, 2020. The purpose was to find out which series interested young people more and the reasons of their preferences. There was a huge variety of answers. From the most mentioned series we selected those that led to contrasting interpretations regarding youth themes and others aimed at wider audiences. Also, two were Spanish and two

British. These were the four series around which conversations were analysed:

- "Money Heist" (2017, Spain). Broadcast on Netflix, the fourth season began on April 3rd, 2020, during the period analysed. The plot revolves around two heists in emblematic places in Spain: *Casa de la Moneda* (the Mint) and *Banco de España* (the Bank of Spain).
- "Elite" (2018, Spain). A youth themed series, broadcast in 190 countries. It narrates the life of a group of students in an elite school, where different social classes coexist due to the grant system for some of them. The third season began on 1st March 2020.
- "Sex Education" (2019, United Kingdom). The plot is related to an insecure young man who has an answer to anything related with sex because his mother is a sexologist. A classmate of his school encourages him to open a sex consultation service. The second season began on 17th January 2020.
- "Peaky Blinders" (2013, United Kingdom, BBC). Five seasons, the last began on 22nd September 2019. A family of gangsters from Birmingham after the First World War (1914–1918), control a horse racing betting establishment. It covers adventures and conflicts with the police.

Analysis Processes

The first challenge faced by the researcher is to channel the flow of digital texts. The minimum units are what is defined as mentions. Particularly, any message or publication filtered from the terms of the titles of the series collected on Twitter, YouTube, Facebook, and digital texts that appear on the internet (for example, news, forums, or blogs). Each of these mentions are issued by certain users, which can be accessed directly through their personal or institutional accounts. Each one can be the author of one or multiple mentions. The software provides demographic data, such as age or gender, and most prominent users—those who have sent more messages who have had greater impact due to the number of their followers. We should emphasise that this type of study includes the total population that participated in the social network within the specified data input period. This is not a representative sample.

We combined quantitative and qualitative analyses. A synthesis of the analysis processes used in contained **Figure 1**. Information seeps progressively through circular analysis in which these processes interact.

First, define channelling information from the terms used in the indications. These channellers are relevant for answering the research questions (Kitchin, 2014) and, in the case of this study, four were used, each of them corresponding to the series viewed.

Second, define a set of core themes, semantic, or conceptual units, which arise from the terms most frequently mentioned through a process of content analysis conducted by theoretical assumptions related to the research objectives.

Third, the categories will be grouped into these nuclei. This is dynamic since they can vary and adjust whilst the flow of the conversation lasts (Panda et al., 2018). To define the system the presence of certain terms as the theoretical model on which the work is based will be considered.

Fourth, each of the mentions can be analysed from the perspective of discourse analysis, contextualising it in the flow of specific conversations in order to define the meaning that the speaker seems to attribute to it (Gee, 2014; Jones et al., 2015).

These processes interact circularly over the course of input and data collection. They have conditioned the way this work presents data sources, analyses, and results. Finally, it should be noted that several transcripts exemplify the thematic nuclei of the analysis. The reason for selecting these and not others is a decision of the research, considering them as relevant examples of the category. Discourse analysts (Gee, 2014) point out the limitation related to the fact that not all transcripts could be analysed in-depth. It should note that the software allows access at any time to the original text and reviewing in deep as necessary. It is up to the researcher to choose the examples to consider. The decision relates to the degree of representativeness of the transcript, in the opinion of the investigator, about the category exemplified.

CHANNELLING RELEVANT INFORMATION: SOURCES OF INFORMATION, EVOLUTION, AND DEMOGRAPHY

Sources

Observing the sources from which data are generated, differences appear regarding the weight of each of these sources. Of the total mentions (17,735), those with a greater weight correspond to digital texts, called media (6,594), and Twitter (6,408). The weight of each source in each of the series was considered and appears in the table.

Considering the weight of each medium in the total mentions of each series, two patterns are observed in **Table 1**. The British series in which the mentions that appear on Twitter have a greater weight (Sex Education, 77%) and Peaky Blinders (84%).

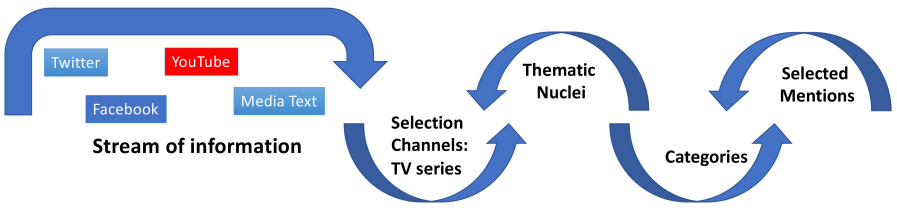

FIGURE 1 | Analysis processes.

TABLE 1 | Sources, frequencies, and percentages.

	Money Heist	Elite	Sex Education	Peaky Blinders	Total
Media	3,776 (42%)	2,394 (56%)	151 (22%)	282 (16%)	6,594
Twitter	2,837 (31%)	1,574 (37%)	526 (77%)	1,471 (84%)	6,408
YouTube	1,673 (19%)	315 (7%)	6 (1%)	3 (0%)	1,997
Facebook	715 (8%)	21 (0%)	0 (0%)	0 (0%)	736
Total	8,992 (100%)	4,304 (100%)	638 (100%)	1,576 (100%)	15,735

The fact that it is in the Spanish series (Money Heist, 42% and Elite, 56%) where the media acquire a greater weight, may be because expert criticisms appear in digital magazines more than in social networks.

TV Series During Lockdown

An initial observation of the data show that the mentions of the series during total lockdown, when people were unable to go out of their homes, account for 87% (13,695 mentions) of those analysed over 3 months. These data may be related to others which show how Internet use increased in homes during the strictest stage of lockdown (Belson, 2020, May 28).

Figure 2 contains the evolution of the number of mentions during this initial stage of total lockdown, through a semi-logarithmic scale, whereby the evolution of the number of mentions in each series may be compared.

The data show different patterns regarding the number of mentions broadcast. The most relevant data is that which occurred on 3rd April in relation to Money Heist (1,224 mentions), when the fourth season began. It also highlights the fact that the other Spanish series, Elite, which deals with youth themes, saw a progressive rise until 20th March, up to 409 mentions, which then dropped to 46 the following day and hardly varied over time. A relatively inverse role occurred with Sex Education, where 2nd April was one of the lowest days. Peaky Blinders, the series with a more continuous profile, had its highest peak on 15th March (225 mentions) and this oscillated until the second peak (73 mentions), which then stabilised until almost the end in a continuous line. These data show that, apart from lockdown as such, there are other factors arising from context, especially at the beginning of a season.

Users

Table 2 includes the total data obtained and considered, monitored through the Coronavirus[1] filter. Both frequencies and percentages were included. As may be observed, the number

[1]Coronavirus, covid-19, shortage, under-supplied, provision, provisioned, queues in the shop, human avalanche, waiting for them to open, lacking products, they lack products, a lot of people waiting for them to open, multitude of people waiting, Coronavirusmadrid, mob storming a supermarket, queues of people with full trolleys, CoronavirusESP, COVID19espana, people who are buying up stuff madly, under-supplied, CODVID19, pandemic, all food completely wiped out,COVID19españa, fake news, sacking, looting, coronavirusEspana, it is empty, they have hardly any, there is hardly any, multitudinous events, virus, masses of people, swept away, wiping out, covid, protocols of action, contagion, infected, people infected, contagions, people wiping out, @CoronaVid19, mask, masks, lockdown, COVID2019, provisions, buying just in case, coronavirusEspaña, INFOCoronavirus, CerradMadrid, coronaviruspanicoorealidad, bags on the head, crowds, covid_19, CoplasConCoronavirus, corona virus, covid2019, covid19, confinement, I am staying at home, mequedoencasa, yomequedoencasa, state of emergency, coronavirus, #YoMeQuedoEnCasaConCerveza, #DiarioDeCuarentena, #Yomecorono, #unidosmasfuertes.

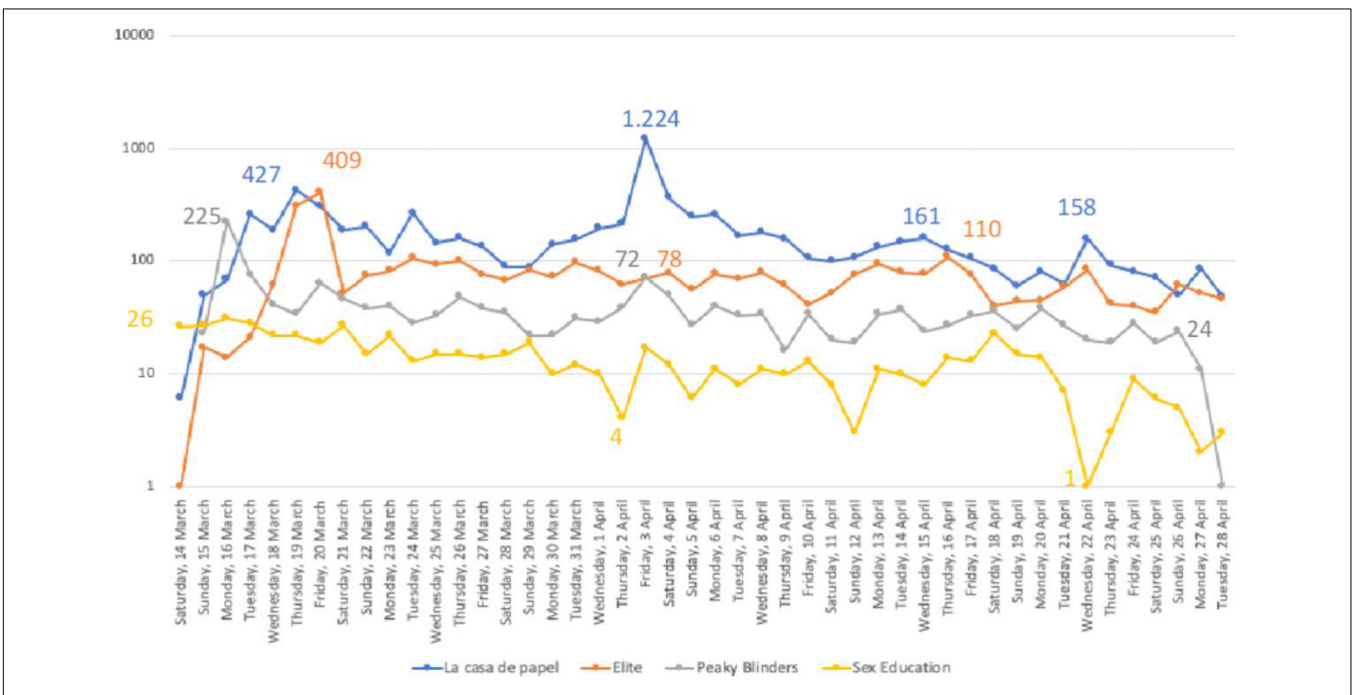

FIGURE 2 | Semi—logarithmic scale. Evolution of the references to coronavirus in the first lockdown phase.

TABLE 2 | Mentions and users.

	Money Heist	Elite	Sex Education	Peaky Blinders	Total
Mentions	8,992 (57%)	4,304 (27%)	683 (4%)	1,756 (11%)	15,735 (100%)
Users	3,977 (53%)	1,703 (23%)	495 (7%)	1,377 (18%)	7,552 (100%)

of mentions was presented and the users who procured them, together with the sources which generated them.

Regarding mentions, there was a total of 15,735 mentions by 7,552 users, although distribution implied notable differences between the series. Money Heist, where mentions account for 57% of the total (8,992 mentions) is outstanding, compared with the 27% (4,304, mentions) for Élite, and the much lower percentages for Peaky Blinders (11%, 1,756 mentions) and Sex Education (4%; 683 mentions). A relatively similar distribution was observed regarding user percentages. Specifically, 53% gave mentions (3,977) in Money Heist, 23% in Elite (1,703 users), 18% in Peaky Blinders (1,377 users), and 7% in Sex Education (495 users).

These data show that the Spanish series, Money Heist and Elite generated higher audience participation. It is relevant that Elite began its third season on 13th March and Money Heist on 3rd April, which no doubt generated a higher volume of mentions in conversation. In both cases, the contents of the corresponding series were available the day they began to be streamed through Netflix.

Demographic data are scarce, since users do not always offer this information. Regarding gender, of the 4,580 users, 2,511 were men (55%) and 2,069 were women (45%). There were no differences between the series. Regarding age, only 307 users offered this data, with most (177 users, 58% of the total) being aged between 18 and 24 years of age; 56 personas stated they were aged between 24 and 30 (18%); and 31 users (20%) being under 18; 43 people (14%) were over 30 years of age.

SEARCHING FOR MEANING TOWARDS THEMATIC NUCLEI

In this study, we examine the content of conversations on the Internet, to analyse the representations that users construct of the TV series they watch. This requires looking for the semantic proximity of the terms used in these conversations (Armborst, 2017). The data related to the content of these conversations arise from the analysis of the most frequent terms in the mentions of the series, included in **Table 3** and **Figure 3**.

Our methodological challenge requires combining quantitative and qualitative approaches (Paoletti et al., 2021). This also implies an interaction between theory and data through a double process that is inductive (most frequent terms considered as shown in **Figure 3**) and deductive, because to define the thematic nuclei that group the categories, the theoretical model on which the research questions are based is also considered (Boellstorff, 2012).

In consideration of the semantic meaning of the terms appearing in **Figure 3**, three thematic nuclei were defined for the organisation of the different categories.

Coronavirus setting: this includes terms such as quarantine, covid-19, or lockdown. They allude to the general context of the pandemic in which the series was viewed and allowed us to talk about situated narratives (Page and Thomas, 2011; Ryan, 2019).

Immediate contexts: everyday routines and social relationships. Terms such as week, people, and lifetime are included (Page, 2010; Sundet and Peteresen, 2020).

Multiple worlds figuring in the series: the presence of terms such as lifeworld, protagonist, fiction, actress, or character.

Figure 4 shows these nuclei along with the categories that each one includes. All of this will allow us to delve into the representations of the series that people have built in times of the pandemic. They are progressively defined combining quantitative and qualitative analysis.

TV SERIES DURING CORONAVIRUS

Coronavirus Setting

The first thematic core directly refers to the lockdown situation in which people watch the series. The categories included in this nucleus appear in **Table 4**. Its definition is related to the terms from which the category has been delimited in the search in Spanish.

The data included in **Table 5** show that the category with the most weight is, in all cases, the one related to references to covid. It is higher in the case of Peaky Blinders (80%) and somewhat lower in Elite (67%). They also allude, in second place, to quarantine, as it is distributed between 20% in Elite and 52% in Sex Education. These data show that the phenomena directly related to the pandemic are more relevant than the consequences that derive from it, such as hospitalisation and even the fact of necessarily staying at home (Werron and Ringel, 2020).

Through a qualitative analysis, it is possible to delve into the meaning that people attribute to their practices. Transcription 1 contains a set of examples where discourse analysis complements the big data. These mentions which appear on Twitter reveal that the participants express situated narratives, talking from many voices and viewpoints, set in time. There are dynamic texts where the people reinterpret the series content (Page and Thomas, 2011; Ryan, 2019) and, as observed in the texts, talk about aspects which are closely linked to their own circumstances, and to those the series has represented at that time of the lockdown.

Transcript 1[2]. Series as forms of escapism during lockdown. The beginning 14–15th March

> *1.1. Pakito OD @pacoliaco (11:44 PM · Mar 15, 2020)*
> I've just finished day two of being locked inside the bedroom. I have watched 3 seasons of Elite in two days.

[2]To facilitate comments of textural fragments, considered as a unit of analysis, the text fragment is numbered in relation to the number of the transcription and the order it has in the transcription.

TABLE 3 | Frequency of the most used terms in conversations.

Terms	Frequency	Terms	Frequency	Terms	Frequency	Terms	Frequency
Quarantine	5,628	Video	669	Funny	454	Commentary	297
Money	4,508	Time	629	Virus	445	Final	291
Heist	3,907	Actor	603	Week	416	Episode	284
Season	3,789	Chapter	553	Movie	402	People	276
Serie	3,764	2020	537	Pandemic	365	Bill	273
Coronavirus	1,592	World	529	Success	353	Channel	272
Premiere	879	Lifetime	508	Time	352	Crisis	269
Lockdown	859	April	505	Protagonist	337		
Part	685	Moment	490	Fiction	323		
Actress	669	Character	477	Platform	308	Total:	37.497

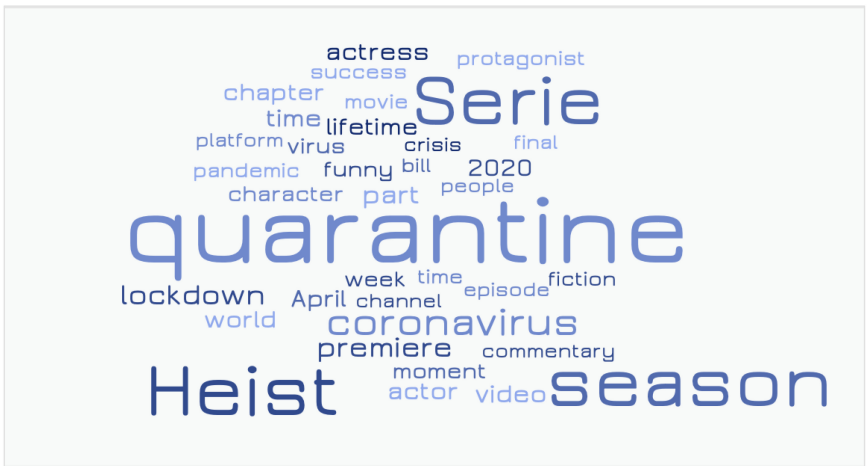

FIGURE 3 | Word cloud. Terms used MOST OFTEN in conversations.

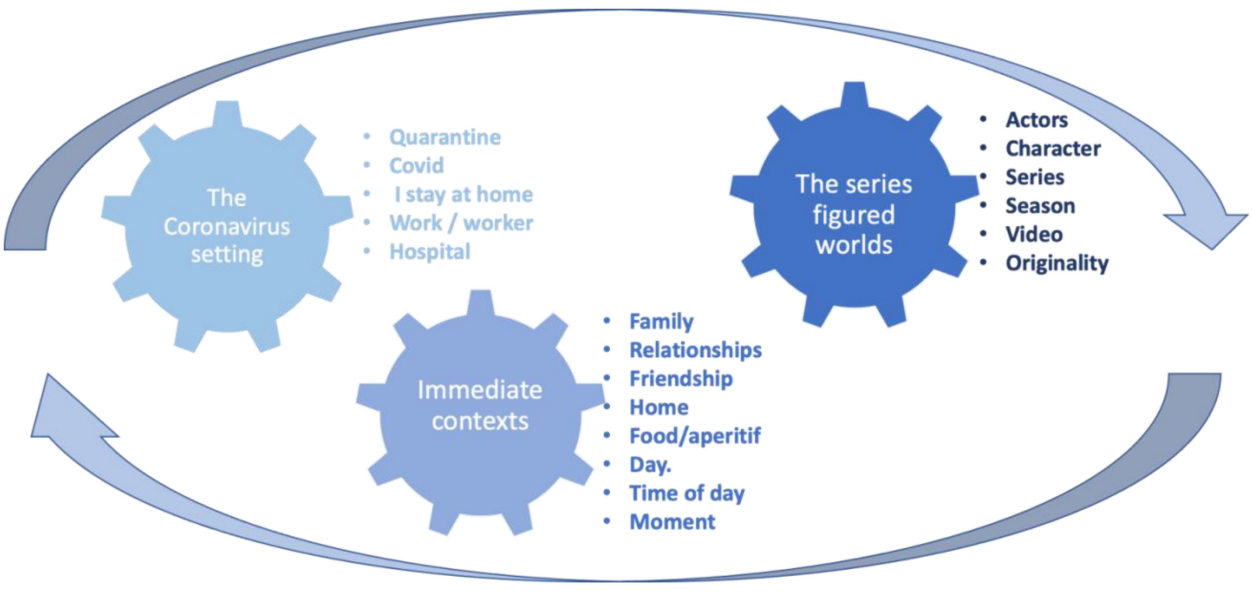

FIGURE 4 | Thematic nuclei and categories.

TABLE 4 | Analysis categories related to the coronavirus setting.

Categories	Terms and concepts included in the search in Spanish
Quarantine	Quarantine, confined (singular), confinement, locked down (plural), locked down (singular), lockdown, confined (plural).
Covid	Covid, covid19, covid2019, covid-19, covid-2019, covid_19, covid_2019, cvd.
Stay at home	I am staying at home, I stay at home, Iamstayingathome, Istayathome, stay at home, stayathome, stayingathome athome.
Work/worker	Work, Works, male worker, female worker, workers, occupation, job, labour, labours, we work, I worked, they worked, he worked hard, they worked hard, fight, they fought, I fought, he fought, work hard, getting on with it, laborious, diligent, hard-working, entrepreneur, solicitous, hard-working, untiring, indefatigable, industrious, blue-collar worker, operator, day labourer, salaried, producer.
Hospital	Medical centres, clinic, clinics, hospital, hospitals, outpatients, healthcare, healthcare professional, ambulance worker.

Now what can I watch? Any recommendations? When does the new @lacasadepapel season start??? @NetflixE you could bring out new cool things.
https://twitter.com/pacoliaco/status/1239321724551860227
1.2. Suelta La Sop @SueltaLaSopaTV (7:00 PM · Apr 27, 2020)
The main character of Money Heist, is living in a nightmare together with her husband and experiences weird things in her body after testing positive for coronavirus.
https://trib.al/MyotSlz
2 Likes
https://twitter.com/SueltaLaSopaTV/status/1254817627345768448
The concept of the situated and interactive storytelling implies a set of meanings (Fiske, 1987) which audiences express in relation to the situation the pandemic has put them in. The meanings are related to the voices that express them. Statements in the first person appear which express feelings or emotions generated by the situation, "Well, I have just finished day two of being shut in my bedroom" (1.1), that reveal the awareness of the first day of lockdown.

A different voice, which to some extent, could be that of the narrator is introduced in the fragment 1.2. "The main character of Money Heist, is living in a nightmare together with her husband and experiences weird things in her body after testing positive for coronavirus." Looking at the sending of the message, in this case, it is not a fan but a series follower. The author, @SueltaLaSopaTV, is from an entertainment portal TeleMundo,[3] a north American TV station, which communicates in Spanish, with accounts on Integra and Facebook. It may be said that whoever issues this type of message works within a participative culture (Thornborrow, 2015) and tries to take on the role of someone expert who speaks in the third person. The texts are produced in a digital environment to allow the digital media to talk to the audiences and impact the way in which contents are generated and interpreted (Rudrum, 2005; Monfort, 2007).

[3]https://www.telemundo.com

TABLE 5 | Frequencies and percentages of mentions regarding the coronavirus setting.

	Money Heist	Elite	Sex Education	Peaky Blinders
Quarantine	1,117 (17%)	628 (20%)	52 (9%)	174 12%)
Covid	4,852 (73%)	2.062 (67%)	442 (77%)	1,129 (80%)
I stay at home	205 (3%)	204 (7%)	16 (3%)	15 (1%)
Work/worker	159 (2%)	52 (3%)	11 (2%)	30 (2%)
Hospital	297 (4%)	142 (2%)	53 (9%)	60 (4%)
Total	6,630 (100%)	3,088 (100%)	574 (100%)	1,408 (100%)

Immediate Contexts: Everyday Routines and Social Relationships

Below is the content of messages grouped around a system of categories thematically linked to the relevant context relating to Coronavirus. The social relationships mentioned by the message issuers appear (family, relationships, friendship). Spatial situation, where the home or accommodation is referred to and the time period, alluding to different stages of the day and to specific moments. These categories are continued in **Table 6**.

In this case, **Table 7** shows the patterns regarding category distribution, which in the series are similar with the exception of Elite where references to food or aperitif are practically absent (0.30%). It is of note that the weightier categories are social relations (e.g., Money Heist, 1980 mentions, 21%) and references to specific moments (e.g., Peaky Blinders, 266 mentions, 24%). Here are some examples:

Transcript 2. Time and space

Meal's time
2.1. @marianietodiaz (24 mar 2020–9:00 a.m.)
Being in lockdown has led to new routines in my life. One of the ones I most enjoy: having breakfast whilst watching a chapter of a series. Last week it was #Élite, this week, #VidaPerfecta.
645 Following–1,776 Followers
1 like
https://twitter.com/marianietodiaz/status/1242360695997575168
Home
2.2. Highlightedcomment (8 months ago)
Comment in the Élite account | Advert of season 4 Youtube Diana Rodriguez
It's funny the way these news items fill our hearts during this pandemic, the guys seem to speak to each one of us at home. Watching them both peaceful and excited at the

same time is contagious and waiting to go out becomes more light-hearted. Thanks to you!!
https://www.youtube.com/watch?v = LM7aicp70UA and lc = Ugw1MczpbX5_7aGnUiB4AaABAg
Day
2.3. @MariaPalmero_ (10:17 a. m.–3 abr. 2020)
It's Friday already. What is bad? That we continue to be shut in. What is good? That we are still alive. The best? That this evening I have plans: see #LCDP4 👏👏 (I would prefer to go dancing but everyone has to get in a good mood any way they can my friends.) # Happy Friday and I really recommend the series @lacasadepapel https://t.co/ssUr57ejLS
11 likes
1,138 Following 8,547 Followers
https://twitter.com/MariaPalmero_/status/1245988813060689921.

Audience practices are relevant and associated with watching series (Transcript 2.1). As a regular and pleasurable habit, mealtime helps to organise life in the pandemic to some extent (Werron and Ringel, 2020). One could also think that the reference to the home, to one's own house, could be agreeable but it is not always the case. On the one hand, the house alludes to a lockdown situation: *"the guys seem to speak to each one of us at home. And waiting to go out becomes more light-hearted"* (Transcript 2.2). In this case, the fragment is a comment about one of the videos which appear on the YouTube account of the series, Elite, which they have highlighted as the most relevant. The message has been generated in a transmedia context (Jenkins et al., 2017; Sundet and Peteresen, 2020).

Let us now look at the time references, another dimension of the context. Those who issue the message are in immediate time, related to watching the series and to other types of daily life activities (Lacasa, 2020). When fragment 2.3 is examined in detail, the author is defined in the profile as a journalist with 8,547 followers. People build up stories (Archakis and Tzanne, 2005) relating to their daily life, meaning that the TV series becomes partly their own story. Again, it is a transmedia context (Passalacqua and Pianzola, 2011), because in the text, social media are combined with a series which they will have surely watched from a streaming platform. We can clearly see that these media contents define leisure time during the pandemic.

TABLE 7 | Frequencies and percentages of mentions regarding close context.

	Money Heist	Elite	Sex Education	Peaky Blinders
Family	507 (5%)	364 (6%)	48 (8%)	67 (6%)
Relations	1,980 (21%)	1,386 (24%)	105 (17%)	167 (15%)
Friendship	1,620 (17%)	1,199 (21%)	103 (16%)	160 (14%)
House	644 (7%)	518 (9%)	45 (7%)	78 (7%)
Food moment	1,559 (16%)	17 (0,30%)	127 (20%)	219 (20%)
Day	768 (8%)	532 (9%)	52 (8%)	93 (8%)
Day time	670 (7%)	498 (9%)	19 (3%)	71 (6%)
Moment	1,826 (19%)	1,148 (20%)	131 (21%)	266 (24%)
Total	9,574 (100%)	5,662 (100%)	630 (100%)	1,121 (100%)

Below, in Transcription 3, there is another of the dimensions which defines the context, close or distant social relations. Two relevant themes have been selected: family and looking for a partner.

Transcript 3. Social relations

The family
3.1. @esunen (16 mar. 2020/9:58 p. m)
My daughter aged 16 has suggested we watch a series together to help pass lockdown. Obviously we said yes and we accepted that she choose it, so I have been watching Sex Education for ten minutes. this lockdown is going to be very long.😅
879 Following–5,283 Followers
28 Retweets/4 Tweets citados/299 Me gusta
https://twitter.com/esunen/status/1239657225523802112
Looking for a partner?
3.2. neofjcn01 (2020/04/13–17:06)
am using Tinder these days in lockdown to meet people. I ask them for recommendations on series. You can't imagine how many people have recommended this rubbish to me. I immediately block them for their basic and vulgar tastes. Greetings.
Comment on YouTube
Highlighted comment

TABLE 6 | Analysis categories related to close context.

Categories	Terms and concepts included in the search
Family	Family, relative, families, relatives, family, familiarity, familiarise, familiarised, multifamiliar, unifamiliar.
Relationships	Relation, relationship, relations, partner, partners, male friend, female friend, male friends, female friends, family, familiar, families, married couple.
Friendship	Friends, colleagues, team, friendship, female friends, female friend, friends, loyal friend, loyal friends, loyalty, friend,
Home	House, flat, suite, home, detached house, attic flat, houses, flats, my room.
Food/aperitif	Aperitif, aperitifs, snack, snack, bite, snacking, fridge, eats tapa, tapas, snackette, snackettes, eating between meals, snacking, to snack, canapé, eats, refreshments, canapés, canape, canapes, roll, morsel, bite to eat, bag of crisps, nachos, popcorn, cheese balls, risquetos, sunflower seeds, mention or appraisal of food as a product, food, meals, to eat, eating.
Day.	Days, days, days.
Time of day	Morning, mornings, first thing morning, morrow, night, nights, early morning, early mornings, evenings, afternoon.
Moment	Moment, moments, instant, instants, now.

https://www.youtube.com/watch?v = SIWDVc145zU and lc = Ugzq5gcJqFsChYuNjtR4AaABAg.

We see that the texts relate to family. Again, comments on the series associated with certain practices appear (Lacasa, 2020). In fragment 3.1, the series is linked to a way of passing the time in lockdown: *"My daughter aged 16 has suggested we watch a series together to help pass lockdown."* The author, with 5,283 followers, whose profile says is a politician, is talking in the first person. He expressed ambiguous feelings. Particularly, they seem to be happy to watch *Sex Education* with the daughter but accept that the situation is a bit strange.

Fragment 3.2 also appeals to the need to establish social relations. Again, it places us in a transmedia context (Stein, 2015) which introduces personal stories. In this case, when someone tries to find a partner. It is a YouTube comment, to one of the videos from that application in Money Heist and appears as a highlighted comment. The issuer of the message mentions in their comment one of the mobile apps they usually use to look for new dates, Tinder. They ask for recommendations for passing the time but reject the answers of those who respond. The message generated two interesting comments which reproach the author for not respecting the opinions of others and for depreciating the tastes of others because they are deemed vulgar.

Multiple Worlds Figured in the Series

From the fan community, collective ideas of the series are built up, organised in figured worlds, especially around the actors. Also, the content structure, which is presented through successive seasons, crosses over with continuous views in streaming through different platforms. This is what the categories of **Table 8** show, which refer to the content and form of the series.

Table 9 includes a summary of the big data obtained in relation to these categories.

Let us first look at the big data. Again, the patterns are similar. For example, the category "series" is the one with the greatest weight, particularly in Sex Education (389 mentions, 37%) and Peaky Blinders (594 mentions, 38%). Regarding references to actors, patterns are also like those of Money Heist (2,421 mentions, 16%) and Elite (1,098 mentions, 13%).

Several examples are cited below. Interactivity may be observed between cultural industries and audiences in creating variations in the predefined history. We recall the contributions of Ryan (2011, 2015), who proposed the construction of digital stories into several layers.

Transcript 4. The plot

TABLE 9 | Frequencies and percentages of the mentions regarding form and content.

	Money Heist	Elite	Sex Education	Peaky Blinders
Actors	2,421 (16%)	1,098 (13%)	102 (10%)	142 (9%)
Character	1,443 (9%)	649 (8%)	93 (9%)	112 (7%)
Originality	2,025 (13%)	1,470 (17%)	118 (11%)	201 (13%)
Series	4,226 (27%)	2,502 (29%)	389 (37%)	594 (38%)
Season	3,602 (23%)	1,905 (22%)	265 (25%)	434 (28%)
Video	1,679 (11%)	875 (10%)	87 (8%)	88 (6%)
Total	15,396 (100%)	8,499 (100%)	1,054 (100%)	1,571 (100%)

4.1. YouTube 11 THINGS P5 of MONEY HEIST has to resolve | Netflix España. 1.16M subscribers (May 29, 2020)
284,073 views
Like 11K.110 Unlike
Netflix España 1.16M subscribers
What will happen to Gandía? and Little Arthur?What will Alicia do with El Profesor? How will they get the gold out of the Bank of Spain? There are 11 things from part 5 here from Money Heist which need answers.
#PreguntasNetflix #LCDP #NetflixEspaña
Patricio Pulido 8 months ago
I think Palermo will sacrifice herself or die saving the band, just as Berlin did in season two.
636 like. 26 replies
https://www.youtube.com/watch?v = pNkdkF5Gtf4 and lc = Ugwl6hR4eNrx6rhfqiR4AaABAg-
4.2. Unknown (24 march 2020–15:47 h)
I already know how this great series will end. They will all die of COVID except those who are inside the bank because nobody was contagious and they were in lockdown (but in the bank) the professor will be dying but because he trained the others how to operate and know things like doctors, they will save the professor's life. And Spain will begin from 0 but the attackers will start a new life and without any risk of being captured, Río and Tokyo will be in charge of bringing new generations into the world.🤰🤱
https://www.facebook.com/lacasadepapelnetflix/posts/1153528771664255?comment_id = 690473818374026.

The fragments contained in Transcription 4 show that management is very different depending on the message sender, i.e., informative headlines or individual users. For instance, fragment 4.1 is sent from the official account of Netflix on YouTube. After the fourth season, the title is highly relevant:

TABLE 8 | Analysis categories related to the series content and form.

Categories	Terms and concepts included in the search
Actors	Actors, cast, actor, actress, actresses, role, roles, artist, artists, staff.
Character	Characters, character.
Series	Mention or appraisal of the contents of the televised broadcasting analysed when they are serials, a series or several series.
Season	Season, part, parts, seasons.
Video	Vídeo, video, vídeos, videos, clip, clips, streaming.
Originality	Originality, original, interesting, unique, unique (plural), odd, astounds, interests, interested, amazing, new, unparalleled, exemplary.

"*11 THINGS which P*5 of *MONEY HEIST has to resolve | Netflix España*," and after this, a set of questions are put forward, relating to the plot but seen from the actions of the characters. The idea is to trigger a dialogue through an interactive process with the fans (Lacasa, 2020). If you go to YouTube and look at the comments, the producers have achieved what they appeared to desire. It says, e.g., *"I think Palermo will sacrifice herself or die saving the band, just as Berlin did in season two."* This comment, in turn, generated a discussion within the community. It is obvious that the producer is directing and monitoring the interventions in social networks in his or her interests, e.g., towards where the next season could go (Page, 2012).

Focusing on fragment 4.2, we observe that the author of the message is reconstructing the plot of the future season of the series, in keeping with their wishes, which are no doubt conditioned by the pandemic as evidenced by the quote, *"They will all die of COVID except those who are inside the bank because nobody was contagious, and they were in lockdown."*

As shown, the characters and actors play a relevant role in the story plot in generating content, and this is what the fragments of transcription 5 demonstrate.

Transcript 5. The characters and the plot

> *5.1. Ricardo joseGuarin gonzalez (10 months ago (edited))*
> Highlighted comment in MenteVáhez
> https://www.youtube.com/channel/UCBj-xjl23MHAwH4SRD3Ytvg
> I don't think Alicia joins the band, it would be disappointing to lose the best enemy. Lisbon comes in to replace Palermo as the leader that is for definite. Now Palermo will be more important than anyone not because he is willing to sacrifice himself for his feelings of guilt, but for his commitment to the success of the heist. I don't think they will give away the gold and get confused with their followers. It would be too obvious and predictable. They will get the gold out and use it in exchange for their "freedom," using power and social legitimacy acquired from demonstrating the tortures and unlawful government procedures. The vital thing is no longer the money. But I also know that none of this will happen, which is why the series is so good, you can speculate indefinitely knowing that nobody will know what they will do. Maybe also I watched the season in a single day like all "normal" people do in lockdown. Incidentally I think in the next season they will use the coronavirus. suddenly a new character called Wuhan arrives on the scene...😉
> https://www.youtube.com/watch?v = OK7EePQAK8U and lc = UgyOGCDz4j1-gckk8Pt4AaABAg
> *5.2. #Cuarentena*
> *Álvaro Meana. Élite. Ruth Franco Apr 12, 2020*
> 40 views
> 19 subscribers
> Scene of the discussion between Nano and Samuel in the series "Élite."
> Interpreted by Álvaro Meana.
> The casting directors, Eva Leiraand Yolanda Serrano, have created the initiative of #Cuarentena creativa. they have proposed a series of scenes on Instagram to get everyone going in these times of lockdown. I hope you like it!
> https://www.youtube.com/watch?v=8M0sW7K57Bk.

Looking at fragment 5.1, it concerns the reconstruction of the series through the characters, although they are getting into the plot. The text appears to be a comment of an analysis of the series *Money Heist*. The author has created a channel with interests in broadcasting and marketing to promote books, films, and series as multimodal forms of expression of fans, promoted from the cultural industry. In the case of this fragment, the messenger reconstructs the plot from the characters: *"I don't think Alicia joins the band, it would be disappointing to lose the best enemy."* Other plot elements are also included: "*I don't think they will give away the gold and get confused with their followers. It would be too obvious and predictable,*" something which had occurred at the end of the other season. There were even explicit references to Coronavirus through the characters: *"Incidentally I think in the next season they will use the coronavirus. . . suddenly a new character called Wuhan arrives on the scene."*

It is also worthwhile looking at fragment 5.2, which appears as a clear example of interactive text (Ryan et al., 2017), both with the producers and the series content. It is fully immersed in multimodal discourse. It shows how the professionals who take part in the production of Elite suggest creative tasks around this fiction for their followers. The initiative takes place through YouTube and falls without the framework of the so-called *#cuarentenacreativa*,[4] that invites fans to offer their own productions. The fragment included presents the performance of one of the fans of the Elite series. It can be compared with many other performances or creations in the hashtag *#cuarentenacreativa*, which in turn contains 473 videos. The work relating to the fans and the professional actors would merit a separate study relating to the use of multimodal discourses between fans.

CONCLUSION

This paper has analysed conversations from viewing streamed TV series. It focuses on social networks and digital media produced texts, for example, photos, magazines, and digital press. It is accepted that narrative construction is a situated process and observation is made of how it is constructed during lockdown in Spain in 2020. The daily lives of people were suddenly disrupted and everyday personal, working, and even leisure routines had to be reorganised. The streaming of television series became a relevant activity at the time, conditioned by the situation experienced. This was projected in the way in which people constructed the representations of the series as discussed on the Internet.

[4]#cuarentenacreativa https://www.youtube.com/hashtag/cuarentenacreativa created by Eva Leira and Yolanda Serrano, casting managers of https://leirayserrano.com an in-depth search to gain access to productions relating to the series Elite https://www.youtube.com/results?search_query=cuarentena+creativa+elite.

Against this backdrop, this study proposed two objectives. Firstly, to analyse the said representations within their context and secondly, to combine quantitative and qualitative methodologies to probe into the meanings people constructed in their daily lives.

Representations of the TV Series in Context

Talking about situated narratives, constructed from television series requires analysing the interpretations people build up and express through their conversations. This was the first objective of our analysis. Examining conversational contents led to three different thematic nuclei being outlined in context: community and institutional, interpersonal, and personal (Rogoff et al., 1993; Matusov, 2007).

We understand the context and environment in which people are immersed and which in the case of this paper is interlinked with the content of the series (Lacasa, 2020). We can speak of a triple plane on which three thematic nuclei are present. Different levels are revealed. The planes demonstrate different dimensions of the context, i.e., the awareness of the representations is represented on three interlinking planes. None of which are inseparable from the other insofar as they suggest an interpretation of the series as they appear in digital texts presented on Internet.

The first representation level involves how people become aware of an event which has institutionally affected the whole community and of which evolve over time (Jenkins, 2010). This is the awareness people have of an event that affects them collectively, but which profoundly affects other levels of their daily life as individuals, and which is apparent in the digital narratives constructed. For example, this level is shown in the thematic nucleus we have called "*The coronavirus setting*." Considering the most frequent mentions in this nucleus, the terms most mentioned are quarantine and staying at home. These terms are present in the interpretation of the series, and this is shown through analysis of the conversations. Conversational units have been probed to conducted discourse analysis. At this level of analysis, many voices may be heard (Archakis and Tzanne, 2005). These use different pronouns to speak in the first person singular or in an impersonal way and they may, for example, appear in media texts.

The second thematic nucleus, called *"Everyday routines and social relationships,"* involves interpersonal relationships, which take place face to face, organised into a copresence which may be conducted online and offline (Bruner, 2002). In this case, the mentions centre on the said relationships, for example, alluding to the family members or friends people rely on during the pandemic. It thus alludes to the fact that the series is watched in company that implies relationships which possibly would not have come about during normal times prior to the pandemic. Relationships between family members or the need to search for a partner are mentioned through digital apps (Ryan, 2019). Again, these situations relate to series interpretation, speaking in the first person to allude to the need for social interaction. Also, people refer to specific situations in which they viewed the series. For example, when they allude to the interpersonal context, people receive the messages emitted by the series directly and personally. These are also related to routines such as mealtimes or to home entertainment situations, given that no other environment is possible.

The third thematic nucleus is on a personal level, and even the identity associated with interpretation of the series in context may be spoken of. We speak of *figured worlds* (Holland et al., 1998). In any event, this personal sphere is not removed from the collective representations of series associated with figured worlds onto which the person is projected in times of pandemic. The said worlds revolve around the concept of the series and its characters. Both are associated with individual practices by the way in which the series is viewed. People binge watch and become submerged in a world as a means of escapism which leads them to think about reconstruction of the series plot. They anticipate future activities of each character, divining the plot of the series. This is the projection of personal desires constructed within a collective framework (Page, 2012). It is also of note that at this personal level the series characters are more important than the actors who play them, because it is easier to submerge oneself in a world of fiction during the pandemic than to think of the actors, themselves, who will be experiencing the same restrictions.

In sum, the series are interpreted according to context, in keeping with their different community, interpersonal and personal levels.

Methodological Goals

The principal methodological goal of this paper was to combine a macro and micro, quantitative, and qualitative analysis. This was the second overall objective.

The first approach to the context was undertaken through *big data analysis processes* (Panda et al., 2018). The software led to the definition of joint categories through a dual process. First, supported by analysis of the terms which most frequently appeared in the conversations—direct intervention was made by the researcher in these definitions. Second, in learning processes carried out from artificial intelligence and which led to semantically classifying the textual contributions of participants in the conversation. We are therefore dealing with categories defined from the software (Kibria et al., 2018). The combination of both types of categories received is the essential channelling of information received through social networks. Data received is structured through these categories, and we obtain quantitative data which we have partially relied upon to define the thematic nuclei mentioned through the successive processes that gave rise to an increasingly more structured information. The interaction between these data and the theory was essential for defining the before-mentioned thematic nuclei (Martínez-Borda et al., 2020).

It was necessary to use discourse analysis (Gee, 2014) to probe into the meaning people expressed in their conversations and to which no access is possible through quantitative data, at least for the moment. In this way, quantitative analysis was complemented with other types of qualitative data which was exemplified in the different examples of digital texts included through transcriptions (Lacasa, 2020). These examples were selected from among all the mentions channelled into each category and are relevant examples with regards to the objectives of the research, i.e., to analyse the dimensions present in the representations which people construct of the TV series, viewed through streaming. These analyses involve focussing on the sequences of words which make sense, and which build up a phrase. That in itself is meaningful. For example, it was relevant to analyse whether, in the internet texts, the authors of the messages speak in the first person, singular or plural, and the expressions they used to refer to context, as they expressed individual goals and feelings present in collective discourse.

Limitations and Further Studies

The limitations of this study are challenges for the future. Firstly, this study was limited to the analysis of four streamed television series. These were chosen in keeping with the preferences of a student sample, with consideration of Spanish or foreign origin and the theme, which was either centred on youth phenomena or not. The second limitation came from the fact that this study centred on conversations in the Spanish language taking place on social media. Thirdly, data was obtained during the pandemic in Spain and not all countries had similar institutional regulations.

Future studies may be conducted along the same lines. They may broaden both the series considered and the languages and social and cultural environments from which the data is collected. It would, however, be necessary to contrast the same series or others if the weight of the context was the same in the construction of representations. Furthermore, what is increasingly more relevant is the need to progressively define the thematic nuclei and the definition categories so that the software used may be more precisely defined. The proposed categories could thus be considered a starting point to be extended and modified. Other thematic nuclei grouping could even be sought.

In summary, the pandemic has generated new online and offline universes, which have been uncommon up until now, and which also include transformations in leisure situations. Extending the study of these environments, beyond streamed TV series, is one of the pending challenges of research. Study fields and the processes of data analysis need to be extended, e.g., towards videogames or other interactive media so that narratives may be constructed collectively and in real time.

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

Ethical approval was not provided for this study on human participants because the University of Alcalá has an Ethical Code, but not a Committee. The study has been developed according to Franzke, Aline Shakti; Bechmann, Anja, Zimmer; Michael Zimmer; Charles Ess, and the Association of Internet Researchers (2020). Internet Research: Ethical Guidelines 3.0. https://aoir.org/reports/ethics3.pdf, and the Code of Ethics for Good Research Practice. University of Alcalá, https://bit.ly/3aQ3oZT. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

RM-B and PL conceptualised the research idea. The whole team contributed to the collection, analysis, and interpretation of data, as well as its discussion. PL redacted the study. All authors contributed to the article and approved the submitted version.

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