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Retweeting my feelings? Exploring the temporal effects of the COVID-19 pandemic on social media use

Shohil Kishore
The University of Auckland, s.kishore@auckland.ac.nz

David Sundaram
The University of Auckland, d.sundaram@auckland.ac.nz

Michael Myers
The University of Auckland, m.myers@auckland.ac.nz

Retweeting my feelings? Exploring the temporal effects of the COVID-19 pandemic on social media use

Full research paper

Shohil Kishore
Department of Information Systems and Operations Management
The University of Auckland
Auckland, New Zealand
Email: s.kishore@auckland.ac.nz

David Sundaram
Department of Information Systems and Operations Management
The University of Auckland
Auckland, New Zealand
Email: d.sundaram@auckland.ac.nz

Michael Myers
Department of Information Systems and Operations Management
The University of Auckland
Auckland, New Zealand
Email: m.myers@auckland.ac.nz

Abstract

Social media platform (SMP) use has intensified during the COVID-19 pandemic. New user groups are utilising SMPs more frequently to satisfy their unmet psychological needs. However, research to date has insufficiently explored variations in SMP use due to the pandemic. As the pandemic has adversely impacted the general public's mental health, we propose and then apply the Temporal-Needs-Affordances-Features (T-NAF) model in this context. Public engagement with two international mental health awareness campaigns on Twitter were tracked over four years. Results show that the pandemic initially coincided with a significant increase in engagement (e.g., retweets) and a significant decrease in network size (e.g., followers). This establishes that a larger proportion of individuals engaged with resharing behaviour as the pandemic commenced, reinforcing the importance of SMPs in relation to mental health and needs satisfaction. This study also highlights the importance of temporality in social media research. Future research pathways are discussed.

Keywords: Social media, mental health, psychological needs, temporality, COVID-19.

1   Introduction

Beyond basic needs, humans are motivated to satisfy their core psychological needs – to feel a sense of belonging, love, and esteem represents the next steps towards self-fulfilment and self-actualisation (Maslow 1943). However, satisfying psychological needs in person, particularly social needs, has become increasingly challenging due to the ongoing COVID-19 pandemic (Dimmock et al. 2022). The pandemic has adversely impacted the general public's mental health, resulting in heightened anxiety and information-seeking behaviour (Zhong et al. 2021). While communication technologies such as social media platforms (SMPs) have been linked to adverse mental health outcomes in the past (Gao et al. 2020; Zhao and Zhou 2020), they are now seen as a "welcomed relief" to the ongoing pandemic (Abbas et al. 2021).

Recent Information Systems (IS) research has shown that the various features and affordances of different SMPs can contribute to psychological needs satisfaction (Karahanna et al. 2018). As studies reveal lower psychological well-being and increased symptoms of stress, anxiety, and depression during the pandemic (Vindegaard and Benros 2020), which coincides with a 61% increase in SMP use (Holmes 2020), it can be inferred that users have developed a deeper dependency on SMPs to satisfy their psychological needs (Meier et al. 2021). However, current theories are developed and evaluated using cross-sectional data, and therefore, are not designed to investigate changes in technology-based psychological needs satisfaction over time or during events. This highlights the importance of two research topics:

1. The adoption of a needs-based lens to examine why individuals voluntarily engage with SMPs (Karahanna et al. 2018), particularly during a pandemic.

2. Understanding how SMP-based mental health discourse has changed during the pandemic as few studies have examined the temporal dynamics of this type of discourse (Biester et al. 2021; Stupinski et al. 2022).

This study contributes to the body of knowledge by proposing and then applying the Temporal-Needs-Affordances-Features (T-NAF) model, which integrates temporality to assess variations in the use of specific SMP features relate to psychological needs satisfaction. The concept of temporality, or time, has the potential to enrich existing theories as it allows us to explore how other variables change as a function of time (Venkatesh et al. 2021). Thus, the specific aim of this study is to demonstrate that temporality, as well as significant unpredictable events such as the pandemic, influence the SMP features utilised by a group of users, which, in turn, provide insights into the psychological needs they are attempting to fulfil (Karahanna et al. 2018). To the best of our knowledge, this is the first study to statistically investigate the temporal effects of the pandemic, particularly in the context of online mental health discourse.

The rest of the article is structured as follows. Section 2 summarises the theory surrounding psychological needs satisfaction and SMP use, introducing temporality as a construct. Section 3 discusses related literature. Section 4 summarises the methodology. Section 5 presents the results. Section 6 discusses the results as well as presents theoretical and practical contributions. Lastly, Section 7 concludes the study.

2   Theoretical Background

The Needs-Affordances-Features (NAF) model theorises that an individual's psychological needs can be satisfied by the variety of affordances and features available on different SMPs, ultimately driving long-term adoption (Karahanna et al. 2018). This model has steadily gained popularity in the IS field driving a new stream of research. While a vast quantity of research has stemmed from Maslow's hierarchy of needs (Maslow 1943, 1954) and Uses and Gratifications Theory (UGT) (Katz et al. 1973) has been used extensively to understand how SMPs fulfil particular needs and gratifications (Ngai et al. 2015; Phua et al. 2017), the NAF model differs from these theoretical approaches. Instead, this model draws from the Basic Psychological Needs Theory (BPNT) which is specific to innate human needs consistent across difference cultures and life experiences (Ryan and Deci 2017). In addition, this model was specifically designed to be applied to SMPs. It claims that variations in the use of a particular feature provide insights into the affordances provided by the platform, and, in the logic of NAF, into the psychological needs that a platform can potentially fulfil (Karahanna et al. 2018, p. 751). The model also proposes different types of affordances: egocentric and allocentric. Egocentric affordances reflect possibilities that are solitary in nature and do not involve others, such as sharing content in the form of a tweet, whereas allocentric affordances reflect possibilities that are social in nature and involve others, such as forming online relationships by following other Twitter accounts (Karahanna et al. 2018, p. 745). Therefore, if there are

significant changes in how a particular feature is used, it can be inferred that there is a corresponding change in the types of affordances being activated and the psychological needs being fulfilled.

Although multiple theories can link psychological needs satisfaction with SMP use, few studies explore the temporal changes in needs during crises, such as the pandemic. Temporality, or time, is a critical construct in understanding the use of IS-related phenomena, particularly during the pandemic, as it allows us to examine phenomena longitudinally (Venkatesh et al. 2021). For example, Suh et al., (2021) demonstrated a significant increase in the expression of basic human needs, and a significant decline in the expression of higher-level needs, during the pandemic. In addition, Long et al., (2020) found a significant decrease in the satisfaction of multiple needs (i.e. relatedness, autonomy and competence) following the first confirmed case of COVID-19 in the state of New York. This indicates that specific features of specific SMPs may have been utilised to a greater extent to satisfy a changing set of needs during the pandemic. As NAF also indicates that engagement with specific SMP features relates to psychological needs satisfaction, we speculate that the use of specific SMP features changed significantly during the pandemic. This process is generalised and presented in Figure 1 as the T-NAF model. By applying this model, we can explore how the needs of individuals participating in online mental health discussions may have changed as the pandemic commenced. This leads to the development of our overarching research question: *How did the behaviour of users participating in online mental health-related discourse change during the pandemic?*
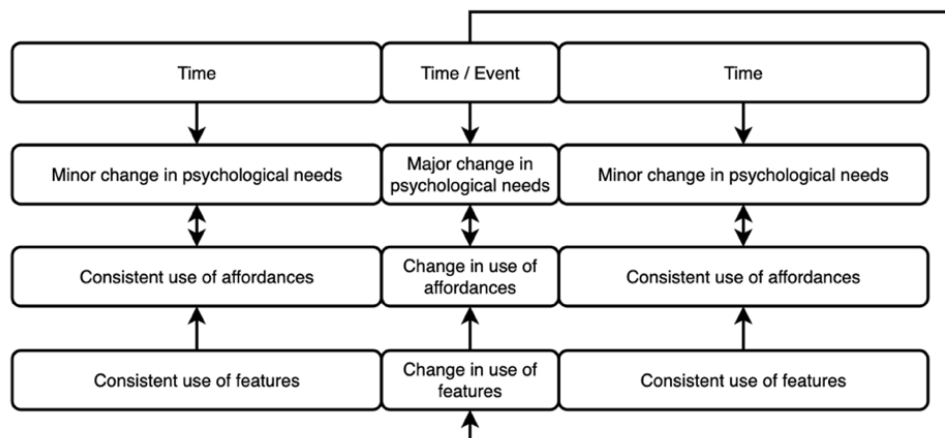

Figure 1: Temporal-Needs-Affordances-Features (T-NAF) model.

3   Literature Review

3.1   Active vs. Passive Social Media Use

Society's reliance on communication technologies, such as SMPs, has grown exponentially during the pandemic (Nabity-Grover et al. 2020; Zhang et al. 2020). Widespread lockdowns, isolation, and uncertainty have reduced access to usual support networks, which are critical for both physical and mental health (Masciantonio et al. 2021). While prior research indicates that high SMP use negatively impacts the mental health of both adolescents and adults (Gao et al. 2020), current research shows that moderate SMP use does not have a negative effect on individual mental health (Coyne et al. 2020), especially in the context of the pandemic (Zhong et al. 2021). In fact, during the pandemic, utilising SMPs has been shown to help mitigate depressive episodes and heightened anxiety levels caused by the abrupt restrictions in how we interact (Nabity-Grover et al. 2020).

Conflict within the topic is linked to how SMP use is measured. For instance, Gao et al. (2020) identified that increased social media exposure due to the pandemic significantly increased adverse mental health outcomes. Zhao and Zhou (2020) also measured use by surveying the total number of hours per day spent on SMPs and found negative effects on overall mental health. By measuring exposure, the distinction between passive and active SMP use during the pandemic is blurred. Passive users tend to scroll through SMP feeds with minimal engagement, whereas active users share life experiences, create content, and interact with others frequently (Escobar-Viera et al. 2018). While passive use is more likely to occur, the same study found that passive use was linked to more than double the rate of depressive symptoms in comparison to active use. Similarly, studies that focused on active use during the pandemic found that SMP use positively affected mental health and well-being if used in moderation (Zhong et al. 2021). In the context of Twitter, for example, positive mental health outcomes are more likely to be

linked to active use (e.g., tweeting original content or retweeting other's content) more so than passive use (e.g., scrolling) (Masciantonio et al. 2021). As retweeting and tweeting represent observable forms of active participation on Twitter, further research into understanding how the use of these features changed due to the pandemic is critical in understanding how online mental health discussion has changed. This forms the basis of our initial hypotheses:

- H1: The average **tweets** of users engaging with mental health-related topics increased significantly as the pandemic commenced.

- H2: The average **retweets** of users engaging with mental health-related topics increased significantly as the pandemic commenced.

3.2 Individual or Influencer?

Certain SMP users, such as influencers, public figures, celebrities, and organisations, are more likely to possess a larger than average network of followers (Djafarova and Rushworth 2017; Harrigan et al. 2021). The more followers a user possesses, the greater their perceived social influence (Jin and Phua 2014). Conversely, individuals are more likely to possess smaller online networks. As SMP use increased significantly during the pandemic, it can be argued that all types of users utilised these platforms to a greater extent (Holmes 2020; Zhang et al. 2020). In addition, while previous studies have found that participation in online mental health discussion is often stigmatised (Li et al. 2018; Moore et al. 2016), both mental health discussion as well as interactions with mental health awareness campaigns have increased significantly in recent years. This indicates that the stigma associated with these topics may be diminishing over time (Stupinski et al. 2022).

As studies of the general public reveal lower psychological well-being and higher levels of stress, anxiety, and depression in comparison to pre-pandemic levels, the destigmatisation of online mental health discourse is likely to have been accelerated by the pandemic (Stupinski et al. 2022; Vindegaard and Benros 2020). Some individuals, for example, may not be able to rely on their everyday face-to-face interactions to satisfy their psychological needs (Dimmock et al. 2022) and thus use SMPs to a greater extent to exchange social, informational, and emotional support (Park et al. 2018; Zhong et al. 2021). Therefore, it is crucial to understand if individuals (who possess generally smaller networks) participated in online mental health discourse at an increased rate during the pandemic. This drives our final hypothesis:

- H3: The average **online network size** (e.g., followers) of users engaging with mental health-related topics decreased significantly as the pandemic commenced.

4 Methodology

4.1 4.1. Data Source

We choose Twitter as our source of SMP data as it is readily accessible to all academic researchers (Twitter 2022). Using Twitter's API instead of scraping data complies with Twitter's Terms of Service and allows for full-fidelity data collection that can be replicated by others (Kishore et al. 2019). As SMP users rely on Twitter to stay up to date with news more so than any other platform (Walker and Matsa 2021), Twitter plays a particularly critical role during the ongoing pandemic (Lee et al. 2021; Wang et al. 2021) which aligns with the purpose of this study.

Twitter is one of the most popular SMPs in the world with over 211 million active daily users (Statista 2022). It allows users to maintain a profile, follow other users or be followed themselves, post short messages (known as tweets) and repost other users' messages (known as retweets). Each message can contain up to 280 characters of text as well as other forms of multimedia such as images and videos. Notably, Twitter allows users to contextualise their tweets by using hashtags. Through hashtags, users can quickly take note of important information and participate in dialogue in real-time as contextual information is created and disseminated (Palen et al. 2009; Rao et al. 2020).

4.2 Data Collection

Data was collected from the month of May spanning 2018 to 2021. These four months allow us to make precise comparisons before (2018 and 2019) and after (2020 and 2021) the pandemic commenced. May represents two major international mental health awareness campaigns, Mental Health Month (MHM) and Mental Health Awareness Week (MHAW). MHM and MHAW are US-based and UK-based campaigns, respectively. Both campaigns have run for over a decade and possess a strong social media presence (Mental Health America 2022; Mental Health Foundation 2022). Neither campaign account

(@mentalhealth or @MentalHealthAm) tweeted significantly more as the pandemic commenced which demonstrates that their online presence was similar to that of pre-pandemic levels. While many other campaigns exist, few have the same international standing as these. Both of these campaigns also encourage reaching out to friends and family to discuss mental health issues which aligns with the overarching research question.

We focused on identifying a group of hashtags that were used consistently over the entire four-year period to ensure comparability. Hashtags contextualise the content that is being posted and makes it simpler to identify tweets that are specific to a topic (Harrigan et al. 2021). This is especially important with a topic such as mental health as discussions exist in many forms. Four seed hashtags related to the campaigns were initially adopted: #MentalHealthMonth, #MentalHealthAwarenessMonth, #MentalHealthWeek and #MentalHealthAwarenessWeek. We used the Twitter Data Toolkit to collect all tweets using each of these hashtags from May of each year (Kishore et al. 2019). Then, focusing on each hashtag, we look for the most popular co-occurring hashtags over the entire period. Hashtags specific to the pandemic were excluded. Through this process, we were able to identify nine of the most popular co-occurring hashtags used throughout the entire period: #MentalHealth, #MentalHealthAwarenessWeek, #MentalHealthAwarenessMonth, #MentalHealthWeek, #MentalHealthMonth, #MentalHealthMatters, #LetsTalk, #TogetherWeCan and #EndTheStigma. By searching for all English tweets that contained any of these nine hashtags, we obtained a total of 3,953,836 tweets over the four years as shown in Figure 2. This dataset is complete and reproducible as it was collected via Twitter API V2. As we were consistent with data collection, it also provides us with a clear frame to compare year-to-year as well as before and after the beginning of the pandemic.
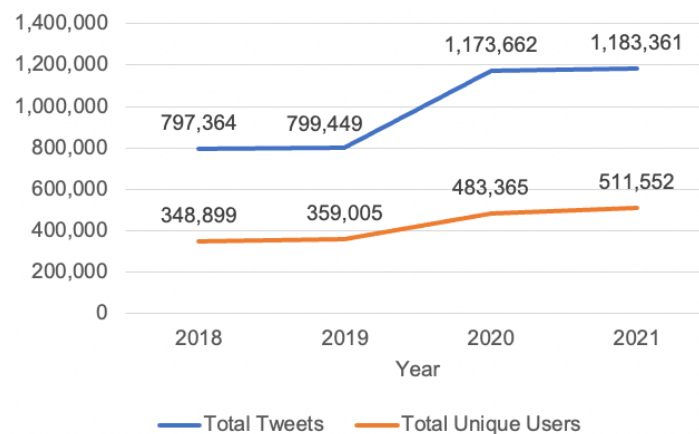

Figure 2: Total tweets and unique users per year.

4.3 Data Cleaning, Aggregation and Analysis

To determine if tweeting behaviour increased significantly as the pandemic commenced (H1), average tweets per user was calculated. By investigating average tweets per user, we can control for each year's varying volume of unique users and their respective tweets. Average tweets per user was then aggregated by day, resulting in 124 data points across the four-year period. This allows us to apply conventional quantitative methods to our dataset. To analyse the data, we conducted one-way ANOVA using SPSS 28. To determine if retweeting behaviour increased significantly as the pandemic commenced (H2), average retweets per user per day was calculated using similar methods.

To determine if online network size decreased significantly as the pandemic commenced (H3), we focused on followers. As followers varied from zero to more than 93 million, we applied the interquartile range (IQR) method to identify and remove extreme outliers. We then aggregated average followers by day, resulting in 124 data points across the four-year period. By evaluating average followers per user, we control for each year's varying volume of unique users. To analyse the data, we conducted one-way ANOVA using SPSS 28.

5 Findings

To test H1, a one-way ANOVA test was conducted to test for differences in tweeting behaviour before and after the beginning of the pandemic. The Levene's test revealed that the homogeneity of variance assumption was not violated. However, the one-way ANOVA results show that there is a statistically insignificant difference across the time period, so the null hypothesis of equal group means cannot be

rejected (p = 0.256). Therefore, there is an insignificant difference in tweeting behaviour before and after the beginning of the pandemic and H1 is not supported.

To test H2, a one-way ANOVA test was conducted to test for differences in retweeting behaviour before and after the beginning of the pandemic. The Levene's test revealed that the homogeneity of variance assumption was not violated. The one-way ANOVA results show that there is a statistically significant difference across the time period, so the null hypothesis of equal group means is rejected (p = 0.007). Post-hoc comparisons using the Tukey HSD test indicated that only the mean score for 2019 (M = 1.36, SD = 0.23) was significantly different to the mean score of 2020 (M = 1.69, SD = 0.52). The mean differences show that users, on average, posted 0.34 more retweets during the early phases of the pandemic (p = 0.005). Therefore, H2 is supported.

To test H3, a one-way ANOVA test was conducted to test for differences in the average user's followers before and after the beginning of the pandemic. As the Levene's test was significant, the homogeneity of variance test was violated. Therefore, we run Welch's test and the Games-Howell post-hoc tests as they are robust to a violation of the homogeneity assumption (Games and Howell 1976; Welch 1947). Welch's test was significant, so the null hypothesis of equal group means is rejected (p < 0.01). Post-hoc comparisons using the Games-Howell test indicated that the mean score of 2018 (M = 2643.64, SD = 581.48) was significantly different to the mean score of 2020 (M = 2212.95, SD = 308.46) and 2021 (M = 2122.84, SD = 372.56). In addition, the mean score of 2019 (M = 2473.48, SD = 353.98) was significantly different to the mean score of 2020 and 2021. The mean differences show that, on average, users in 2020 possessed 430.69 and 260.53 less followers in comparison to 2018 (p < 0.01) and 2019 (p = 0.016), respectively. In addition, users in 2021 possessed 520.80 and 250.64 less followers in comparison to 2018 (p < 0.01) and 2019 (p = 0.002), respectively. Therefore, H3 is supported.

6 Discussion

The beginning of the pandemic resulted in significant changes surrounding mental health-related discussions on Twitter, as summarised in the applied T-NAF model presented in Figure 3. The results verify that different groups of users participated in online mental health discourse on Twitter during the initial phase of the pandemic. For example, as average network size decreased significantly in 2020, and individuals tend to possess smaller online networks than influencers or organisations, this study demonstrates that a larger group of individuals engaged with online mental-health-related discourse as the pandemic commenced.
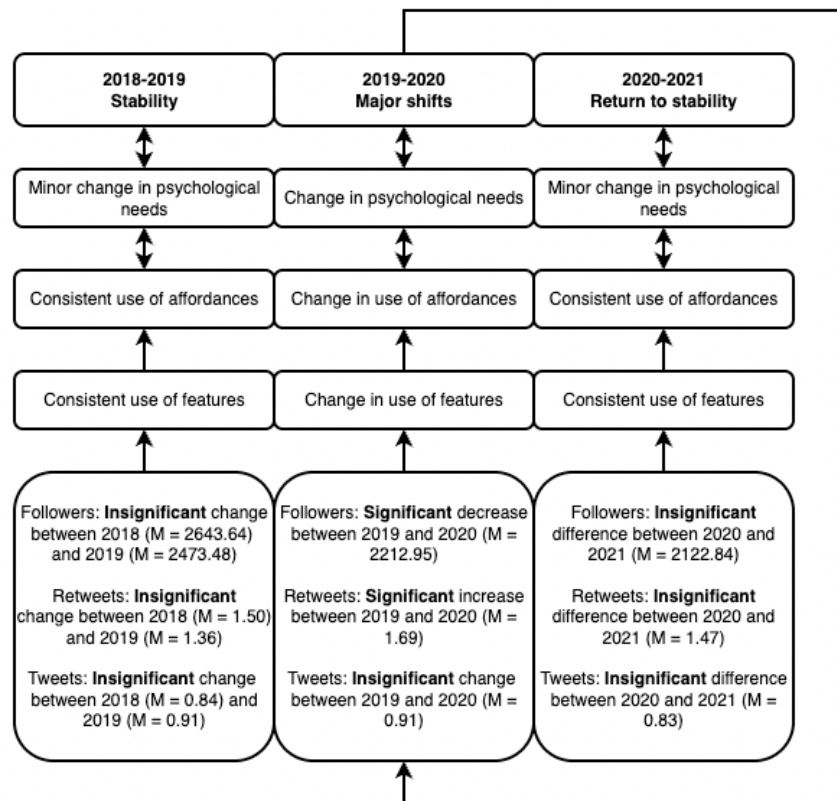

Figure 3: Applied Temporal-Needs-Affordances-Features (T-NAF) model.

Statistically, average retweets per user increased significantly while average user network size decreased significantly, in the early stages of the pandemic (between 2019 and 2020). As shown in Figure 4, these features enabled various affordances which are strongly linked to the psychological needs of autonomy (need to act consistently with one's true self), relatedness (need to interact, connect and experience caring for others) and expressing self-identity (need to communicate identity) based on the NAF model (Deci et al. 1991; Deci and Flaste 1995; Karahanna et al. 2018; Pierce et al. 2003). Specifically, those engaging with mental health-related discourse during the pandemic were more engaged with other-focused allocentric affordances (i.e., relationship formation and meta-voicing) rather than self-focused egocentric affordances (i.e., content sharing). This is further emphasised by the insignificant difference in tweets during the pandemic as this feature is only linked to egocentric affordances (i.e., self-presentation and content sharing). Therefore, it can be deduced that, during the early stages of the pandemic, users engaging in this type of discourse relied on allocentric affordances available on Twitter to a greater extent to fulfil these three psychological needs.
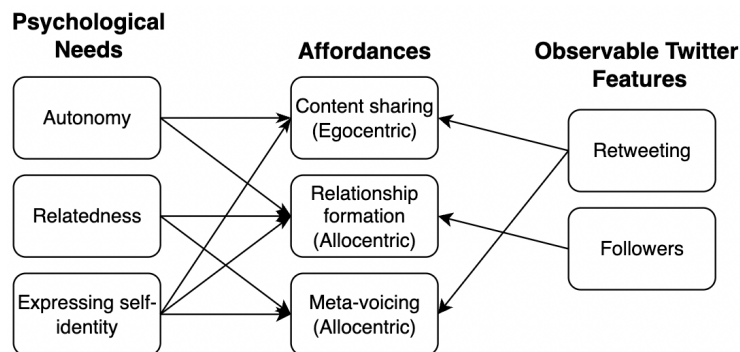

Figure 4: Psychological needs strongly linked to observable Twitter features.

The results also show that this larger group of individuals (vs. influencers) retweeted significantly more during the pandemic. Retweeting or resharing others' content is more accessible and results in less individual vulnerability than sharing original content. Retweeting may be seen as an easier step toward discussing mental health online due to the stigma associated with these types of disclosures. Thus, users newly engaging with these topics were more likely to engage with retweets rather than discuss their own experiences or struggles with mental health publicly online. In addition, if users receive positive reinforcement from their network for participating in these conversations, they may continue to rely on SMPs to satisfy their psychological needs, especially as the implications of the pandemic continue to impact daily life.

6.1 Implications for Theory

The findings demonstrate significant changes in the utilisation of SMP features, specifically Twitter features, to discuss mental health before and after the beginning of the pandemic. Retweets, for example, increased significantly in the early stages of the pandemic. The type of users engaging with these hashtags also changed significantly as they possess smaller online networks in comparison to pre-pandemic levels. In combination, these factors reveal that users engaging with mental-health-related tweets during the pandemic used features differently, possibly due to their evolving psychological needs. While further research is required to validate the impact of the pandemic on psychological needs satisfaction, this research and the proposed T-NAF model demonstrates the importance of incorporating temporality when measuring the relationship between needs and the use of particular SMP features and affordances. This work also demonstrates that the pandemic resulted in users engaging with other-focused allocentric affordances to a greater extent which may be applicable to other contexts as well.

Methodologically, this study presents a novel approach to improve the rigour of social media research. It is difficult for researchers utilising large-scale social media data to show statistically significant differences and make causal claims (Kar and Dwivedi 2020). By collecting data consistently over four years, we create a clear frame to compare year-to-year as well as before and after the beginning of the pandemic. In addition, controlling for the varying number of tweets and unique users, as well as aggregated data by day, allows us to apply conventional quantitative methods which are relatively simple to interpret. This methodology can be applied to other social media research projects where temporality plays a consistent role as it takes advantage of our ability to collect historical data from SMPs. Future social media research should consider applying similar data collection and analysis protocols that extend this methodology's applicability.

6.2   Implications for Practice

Such studies can provide insights to health officials, government agencies and campaign designers interested in how the general public uses SMPs. As more individuals are willing to engage with online mental health discourse in times of crisis, it reinforces the importance of introducing policies and legislation that make SMPs a safe space to interact with challenging topics. This is especially important today, where isolation and lockdowns remain part of the norm. In addition, this study verifies that SMP campaigns are not always led by influencers with large networks. Instead, a growing population of individuals were identified as the driver behind these campaigns during the pandemic. This reinforces the fact that large-scale SMP campaigns have the potential to reach average SMP users and potentially improve public perceptions of online mental health-related discussions.

7   Conclusion

Communication technologies, such as SMPs, play a critical role in maintaining physical and mental health during pandemics. This paper analyses changes in mental health-related discourse on Twitter due to the COVID-19 pandemic with a focus on exploring changes in inferred psychological needs. A longitudinal dataset was collected by tracking nine hashtags and two international campaigns from May 2018 to May 2021. Statistical methods were applied to identify significant changes in observable Twitter features before and after the beginning of the pandemic.

We propose and then apply the T-NAF model, which integrates temporality when assessing a group's use of SMP features and how they relate to the group's psychological needs. Findings reveal that the pandemic coincided with a significant increase in resharing behaviour (e.g., retweeting) and a significant decrease in the average online network size (e.g., followers) of users engaging with these hashtags. To the best of our knowledge, this is the first study to establish that the pandemic motivated ordinary individuals to publicly engage with mental health-related topics online to a greater extent.

The findings demonstrate that a larger proportion of individuals (vs. influencers) participated in online mental health discussions, which, in turn, indicates a change in the affordances individuals are engaging with and the needs they are attempting to satisfy. Specifically, we deduce that, during the early stages of the pandemic, users are primarily attempting to fulfil their heightened need for autonomy, relatedness, and expressing self-identity by engaging with allocentric affordances and Twitter-based mental health discourse to a greater extent. Overall, these findings reinforce the importance of incorporating temporality and psychological needs when attempting to understand how and why individuals use SMPs.

This research creates multiple avenues for future research. First, and most importantly, statistically evaluating if users engage with the same set of features to satisfy the same set of needs over multiple contexts or time periods represents a critical step towards understanding how SMPs contribute to temporal needs satisfaction. Second, carrying out similar studies using other SMPs will increase our understanding of how different platforms, features and affordances contribute to temporal needs satisfaction. Third, it is important to evaluate how other communities use SMPs during pandemics and crises. Fourth, applying text analysis and linguistic methods to understand how the content of tweets changed over time may allow future researchers to understand how users expressed themselves differently. Future studies, both inside and outside of the context of mental health, should consider using a similar methodological approach when examining the temporal dynamics of SMP engagement.

This study should be viewed considering its intrinsic limitations. Due to the design of the Twitter API, only publicly available tweets were included. Therefore, Twitter users with private accounts that used these hashtags were not included. In addition, due to the sheer volume of tweets, this study focuses on the month of May rather than collecting tweets over the entire time period. This also partially explains why we did not collect data from other SMPs. We will consider extending data collection in the future. Furthermore, we cannot accurately track the needs Twitter users were attempting to satisfy across the various time periods. Using this methodology, we can only infer the needs users may be attempting to satisfy. Further work is required to move from inference to causality. Lastly, further work is required to address endogeneity which is common in these types of datasets.

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