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SCIENTIFIC REPORT

Differential Associations of Emotional and Social Loneliness with Adherence to COVID-19 Prevention Behaviours

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Executive Summary

It has been widely reported that compliance with COVID-19 prevention behaviours is associated with greater levels of loneliness. However, studies to date have not thoroughly examined different dimensions of loneliness and their association with COVID-19 prevention behaviour. As such, we examined whether compliance to COVID-19 prevention behaviour was associated with two key dimensions of loneliness: (1) social loneliness *(e.g., feeling disconnected from a broader social network)* and (2) emotional loneliness *(e.g., missing an intimate relationship)*. Understanding these differences can inform our understanding of the nuanced impacts of non-pharmaceutical interventions and identify strategies to promote compliance and/or support individuals who are complying.

Results demonstrated that emotional and social loneliness are weakly correlated – supporting the need to examine their associations with other factors separately. Further, in multivariate models, emotional loneliness was positively correlated to prevention behaviour whereas social loneliness displayed no significant relationship – suggesting that COVID-19 prevention behaviours were not definitively or directionally correlated with one's broader social connections, but were correlated with the absence of intimate and close attachments.

To contextualize these findings, we also asked participants to rate whether they were more or less lonely compared to prior to the pandemic and observed that the level of compliance to COVID-19 prevention behaviours was not correlated with subjective impacts of loneliness.

Taken together, these findings suggest that the relationship between loneliness and compliance to COVID-19 prevention behaviours is nuanced. While, generally speaking, loneliness does not seem to relate to level of behavioural compliance to COVID-19 prevention practices, individuals may experience differential impacts and/or be more or less willing to comply to COVID-19 prevention practices depending on their social situation and level of emotional loneliness.

BACKGROUND

The COVID-19 pandemic prompted widespread behavioural changes intended to mitigate viral transmission. These behavioural strategies, sometimes referred to as non-pharmaceutical interventions, include physical distancing, mask wearing, improving hygiene, and limiting social interactions. Even before the enactment of mandates, engagement in preventative behaviours increased (Perrotta et al., 2021) suggesting this reaction could be an innate response to a perceived disease risk as well as compliance to authorities or changing social norms. This phenomenon is sometimes referred to as "behavioural immunity" and serves as a first line of defense to avoid the high physical costs associated with disease (Schaller, 2011).

Considering the complex nature of the COVID-19 pandemic, there are a myriad of factors that influence individuals' willingness to participate in planned and spontaneous prevention behaviour. Among these factors is loneliness, which can be defined as a subjective, distressing experience that arises when there is a perceived incongruence between desired and actual social relationships (Peplau & Perlman, 1982). Indeed, loneliness is a psychological reaction intended to motivate social connections and therefore may play an important role in the context of social and physical distancing practices. When examining the relationship between loneliness and prevention-related behaviour, research generally supports an association between loneliness and poor health outcomes and risky behaviours (Stickley et al., 2013). Previous studies have linked loneliness to higher odds of smoking, being overweight (Lauder et al., 2006), physical inactivity (Hawkley et al., 2009; Pengpid & Peltzer, 2021), engaging in risky sexual behaviour (Peltzer & Pengpid, 2017) and alcohol consumption (Stickley et al., 2013; Stickley et al., 2014). As such, we might anticipate that loneliness is associated with lower compliance to COVID-19 prevention behaviours. Consistent with this expectation, several studies have found that individuals who are lonelier were less likely to engage in prevention behaviour related to the COVID-19 pandemic such as physical distancing or limiting exposure to people (Amarat et al., 2023; Kang et al., 2021; Stickley et al., 2021).

Associations with COVID-19 prevention behaviour are nuanced and include several potential pathways. For example, those who are more socially integrated (and therefore less lonely) may be more influenced by positive peer pressures encouraging uptake of health behaviours (Tucker et al., 2006). Similarly, those who feel socially excluded are more likely to compromise disease-preventing behaviours in order to pursue social goals (Sacco et al., 2014). Okruszek et al. (2020) found that individuals who felt lonely during the COVID-19 pandemic were less likely to be worried about their physical health and more likely to be worried about the psychological effects related to isolation. Additionally, those who are lonely are less likely to believe the efficacy of prevention (Kang et al., 2021). Schultz & Newman (2023) hypothesize those

who are lonely are less willing to contribute to efforts benefiting others because they do not perceive that their contribution will be reciprocated in the future.

Although there is evidence to support the hypothesis that loneliness may predict lower engagement in prevention behaviour, the context of COVID-19 complicates this assessment since complying with social distancing guidelines or stay-at-home orders might lead to isolation and increased loneliness (O'Sullivan et al., 2021; Teater et al., 2021; Tull et al., 2020; van Tilburg, 2021). Specifically, studies show those who practiced prevention behaviour such as social distancing had an increased likelihood of loneliness (Choi et al., 2022; Cohn-Schwartz et al., 2022) and a decreased perception of social support (Ford, 2021) compared to those who did not comply. These findings align with a previously established association between higher levels of perceived vulnerability to disease and diminished levels of social gregariousness and extraversion (Mortensen et al., 2010; Schaller & Murray, 2008).

Clearly, there are reasonable explanations to support both hypotheses. On the one hand, compliance to COVID-19 prevention behaviours could reasonably cause loneliness – leading to a positive association between behavioural compliance and loneliness. On the other hand, people who are lonely (or less socially connected) might be less likely to comply with COVID-19 prevention guidance – leading to a negative association between behavioural compliance and loneliness. Of course, because the COVID-19 prevention behaviours were instituted at the population level, it may also be reasonable to find no association between levels of loneliness and COVID-19 compliance – because even if an individual is non-adherent, they might nevertheless experience loneliness due to the compliance of others.

An additional factor important to consider is how loneliness is conceptualized. Loneliness is nuanced and can be triggered by lack of fulfillment of various social needs. Weiss (1973) originally conceptualized loneliness as having two distinct dimensions: emotional and social loneliness. Emotional loneliness refers to the felt absence of emotionally intimate relationships, such as a partner or close friend, often resulting in feelings of emptiness, abandonment, or emotional isolation. In contrast, social loneliness describes how connected an individual feels to their broader social network and often manifests in feelings of exclusion, or lack of community or societal involvement. Given that these two dimensions of loneliness describe distinct emotional needs and that people may employ different social strategies to meet these needs, it is possible that the relationships between loneliness and COVID-19 prevention behaviours may differ for these types of loneliness. For example, social loneliness might be more strongly related to social connections – increasing the effects of peer pressure in driving compliance. Additionally, emotional loneliness might be more strongly related to distress, feelings of vulnerability, or other motives that could increase engagement with prevention behaviours. Similarly, compliance behaviours may affect emotional loneliness and social loneliness differentially. For example,

compliance to guidelines may restrict people's access to social connections more than emotional closeness since they can continue to fulfill this need through interactions they can maintain while complying to guidelines. Alternatively, if an individual is already experiencing emotional loneliness, compliance may further cut them off from close relationships and have a greater impact on their emotional loneliness.

Given these nuanced associations and the lack of previous studies examining the differential effects of emotional and social loneliness across prevention behaviours, the present study examines the relationships between emotional loneliness, social loneliness, and adherence to COVID-19 prevention behaviours. Results from this study can improve our understanding of this association and inform the development of tailored health promotion strategies designed to enhance adherence to preventive practices, especially among individuals experiencing loneliness.

METHODS

Data Collection

Participants were invited to complete the Canadian Social Connections Survey (CSCS) using paid advertisements promoted on Facebook, Instagram, Twitter and Google available in both English and French. The first set of data was collected from April 21st - July 27th, 2021 during the third wave of the COVID-19 pandemic when disease prevention mandates were in place such as restricting the amount of people permitted at social gatherings, wearing masks in public places and physical distancing were implemented in most provinces. The second set of data was collected from April 18th - August 31st, 2022 when most restrictions had eased or lifted. Inclusion criteria stipulated all participants to be 16 years of age or older and live in Canada. Participants were compensated for completing the study through entry into a random lottery to win one of 25 $100 gift card prizes. Ethics approval for the study was obtained from the Research Ethics Board at Simon Fraser University and all participants provided informed consent.

Outcome Variables

To measure prevention practices, participants were asked to which extent they were complying with the following 6 prevention behaviours:

- Physically distancing from other by 2 meters
- Wearing a mask in public
- Washing hands often
- Reducing the number of people interacted with
- Avoiding non-essential trips in the community
- Socializing indoors only with people in one's immediate household

For each prevention behaviour, participants indicated whether they had followed the practices "Very Closely", "Somewhat" or "Not at all." Participants indicated whether they had been vaccinated ("No", "1 dose", "2 doses").

Explanatory Variables

Explanatory variables of interest included:

- **Emotional Loneliness.** Emotional loneliness was assessed by 3 items on the 6-Item Scale for Overall, Emotional, and Social Loneliness developed by Gierveld & van Tilburg (2006). Participants responded with either 'yes' or 'no' to questions regarding if they felt a general sense of emptiness, missed having people around or felt rejected. 'Yes' responses were coded as 1s, and 'No's were coded as zeros, all three of which were summed per participant resulting in scores ranging from 0-3.

- **Social Loneliness.** Social loneliness was assessed by 3 items from the Emotional and Social Loneliness scale developed by Gierveld & van Tilburg (2006). Participants responded to 3 questions with either 'yes' or 'no' which assessed if there were people they could lean on when in trouble, people that they could count on completely and people they felt close to. Yes' responses were coded as 1s, and 'No's were coded as zeros, all three of which were summed per participant resulting in scores ranging from 0-3

- **Number of close friends.** Participants were asked how many close friends they had and answered by selecting one of the options including "None", "1-2" "3-4" "5 or more".

- **Time Spent with Friends.** Participants were asked to quantify how many hours they spend with friends that week by selecting one of the options including "No time" "Less than 1 hour", "1-4 hours" "more than 5 hours".

- **Demographic Factors.** Information related to participants' age, gender, ethnicity, income, province, and education level were also analyzed. General Anxiety Disorder (GAD-2) and Patient Health Questionnaire (PHQ-2) were used to quantify participant anxiety and depressive symptoms respectively.

Statistical Analysis

To begin we tested bivariable and multivariable associations between our outcome and explanatory factors using linear regression. Following the results of the bivariable and multivariable tests, we conducted a Multivariate Analysis of Covariance (MANCOVA) to assess the impact of various covariates on multiple dependent variables simultaneously. The dependent variables in our analysis consisted of the 6 COVID-19 prevention practices and the covariates

included all variables of interest. To determine the statistical significance of the relationships between the covariates and the combined dependent variables, we used Pillai's trace as the test statistic in our MANCOVA. This method allowed us to account for potential correlations among the dependent variables in our analysis.

As an additional test exploring the COVID-19 prevention behaviours as an overarching construct, we created a COVID-19 Prevention Behaviours Index (CPB), scoring participant's level of compliance to each prevention behaviour on a scale of 0 (Not at all), 1 (Somewhat), or 2 (Very Closely). Participants vaccine status was scored as 0 (Not vaccinated) or 1 (1 dose or more). Final scores ranged from 0 to 13, with higher scores indicating greater levels of COVID-19 prevention behaviour.

Next, multivariable models were constructed using the R lm() function to identify the association between CPB scores and the explanatory factors of interest, controlling for demographic variables (table 5). Model 1 tested the relationship between CPB scores and emotional loneliness. Model 2 tested the relationship between CPB scores and social loneliness. Model 3 tested the relationship between CPB scores and social time with friends in the past seven days. Model 4 tested the relationship between CPB scores and number of close friends. Model 5 tested the relationship between CPB scores and both types of loneliness. Model 6 further added the number of close friends and time spent with friends in the previous seven days.

As an additional sensitivity test, we examined participants' self-reported changes in loneliness since the beginning of the COVID-19 pandemic in order to understand whether changes in loneliness were related to the stringency of compliance to COVID-19 prevention behaviours – measuring using CPB scores. A figure was produced and statistical comparisons were tested using Jonckheere-Terpstra test, which is a rank-based nonparametric test that checks for a trend across ordered groups.

RESULTS

A total of 1,796 eligible responses were included for analysis. Table 1 provides a demographic description of the sample including age, gender, ethnicity, relationship status, income, province, GAD-2 and PHQ-2. The majority of the respondents were women (58%), White (74.9%), in a relationship (50.7%) and from either British Columbia or Ontario (25.6% and 27.8% respectively). The descriptive results were weighted based on these factors.

Table 1. Sample Description

n	1796
Age (mean (SD))	44.14 (17.62)
Gender (%)	
Man	711 (39.6)
Non-binary	41 (2.3)
Woman	1044 (58.1)
Ethnicity (%)	
Indigenous	105 (5.8)
Visible Minority	346 (19.3)
White	1345 (74.9)
Relationship Status (%)	
In a relationship	911 (50.7)
Single and dating	224 (12.5)
Single and not dating	661 (36.8)
Household Income (%)	
Under $10,000	100 (5.6)
$10,000-$19,999	175 (9.7)
$20,000-$29,999	216 (12.0)
$30,000-$39,999	191 (10.6)
$40,000-$49,999	181 (10.1)
$50,000 to $59,999	149 (8.3)
$60,000 to $69,999	119 (6.6)
$70,000 to $79,999	125 (7.0)
$80,000 to $89,999	90 (5.0)
$90,000 to $99,999	102 (5.7)
$100,000 and over	348 (19.4)
GAD-2 Score (mean (SD))	2.09 (1.70)
PHQ-2 Score (mean (SD))	2.00 (1.74)
DATASET = 2022 Cross-Sectional (%)	571 (31.8)

Table 2 provides an overview of social connection measures including emotional and social loneliness scores. Overall levels of emotional loneliness were higher than social loneliness (2.01 and 1.82 respectively). 19.7% of participants lived alone.

Table 2. Social Connection in Sample

n	1796
Emotional Loneliness Score (mean (SD))	2.01 (1.04)
Social Loneliness Score (mean (SD))	1.82 (1.15)
Number of Close Friends (%)	
None	185 (10.3)
1-2	412 (22.9)
3-4	471 (26.2)
5 or more	728 (40.5)
Time Spent with Friends (%)	
No time	335 (18.7)
1 to 4 hours	637 (35.5)
5 or more hours	376 (20.9)
Less than 1 hour	448 (24.9)
Live Alone (%)	354 (19.7)

Table 3 provides an overview of COVID-19 prevention behaviours. Most respondents followed prevention behaviours very closely. Hand washing and wearing a mask had the highest strict adherence rates (68.0% and 64.4% responding 'Very Closely' respectively). Only socializing indoors with one's household had the highest rates of non-compliance (15.7% responding 'Not at all") followed by avoiding trips (14.0%), reducing social contact (11.7%), mask wearing (11.2%), physical distancing (9.0%) and hand washing (5.4%). Most participants received at least one vaccination (83.7%).

Table 3. COVID-19 Prevention Behaviours

n	1796
Physical Distancing (%)	
Not at all	162 (9.0)
Somewhat	701 (39.0)
Very Closely	933 (51.9)
Mask Wearing (%)	
Not at all	202 (11.2)
Somewhat	438 (24.4)
Very Closely	1156 (64.4)
Hand Washing (%)	
Not at all	97 (5.4)
Somewhat	477 (26.6)
Very Closely	1222 (68.0)
Reducing Social Contact (%)	
Not at all	210 (11.7)
Somewhat	505 (28.1)
Very Closely	1081 (60.2)
Avoiding Trips (%)	
Not at all	251 (14.0)
Somewhat	546 (30.4)
Very Closely	999 (55.6)
Only Socialize Indoors with Household (%)	
Not at all	282 (15.7)
Somewhat	612 (34.1)
Very Closely	902 (50.2)
Vaccination Status (1 or more dose) (%)	1504 (83.7)
Prevention Index (mean (SD))	9.67 (3.16)

The MANCOVA results are shown in table 4, indicating statistically significant, though generally weak associations between the 6 COVID-19 prevention behaviours and measures of loneliness. As with the main analysis, the effect of emotional loneliness was statistically significant, and the effect of social loneliness was not.

Table 4. Multivariable Regression Results Identifying Associations with CPB Scores

	DF	Pillai	F-statistic	P-value
Emotional Loneliness Score	1	0.020	5.191	0.0000
Social Loneliness Score	1	0.006	1.521	0.1555
Number of Close Friends	3	0.130	11.362	0.0000
Time Spend with Friends	3	0.033	2.788	0.0000
GAD-2 Score	1	0.010	2.648	0.0100
PHQ-2 Score	1	0.016	4.069	0.0002
Residuals	1755			

Table 5 shows results from our multivariable models identifying factors associated with CPB scores. All models adjusted for age, gender, ethnicity, income, province and year in which the survey was conducted. Consistent with the MANOVA, across all models, higher emotional loneliness was either marginally or robustly correlated with higher CPB scores. While not statistically significant, we observed the opposite trend for social loneliness, with higher CPB being non-significantly correlated with lower levels of social loneliness. Compared to spending less than 1 hour with friends, spending 1-4 hours or 5+ hours were associated with decreased adherence ($p=0.002$ and $p=0.007$ respectively). Having 5 or more friends was associated with increased adherence to prevention behaviours compared to having 1-2 friends ($p=0.018$).

Table 5. Multivariable Regression Results Identifying Associations with CPB Scores

	B	SE	Statistic	P-value
Model 1:				
Emotional Loneliness	0.150	0.072	2.097	0.036
Model 2:				
Social Loneliness	-0.082	0.061	-1.331	0.183
Model 3:				
Social Time with Friends, P7D: Less than 1 hour (vs. None)	-0.083	0.222	-0.374	0.708
Social Time with Friends, P7D: 1 to 4 hours (vs. None)	-0.429	0.205	-2.089	0.037
Social Time with Friends, P7D: 5+ hours (vs. None)	-0.397	0.229	-1.735	0.083
Model 4:				
Number of Close Friends: 1-2 (ref = None)	-0.014	0.294	-0.046	0.963
Number of Close Friends: 3-4	0.011	0.291	0.039	0.969
Number of Close Friends: 5 or more	0.277	0.251	1.105	0.269
Model 5:				
Emotional Loneliness	0.187	0.074	2.526	0.012
Social Loneliness	-0.123	0.063	-1.937	0.053
Model 6:				
Emotional Loneliness	0.265	0.080	3.313	0.001
Social Loneliness	-0.072	0.069	-1.045	0.296
Social Time with Friends, P7D: Less than 1 hour (vs. None)	-0.314	0.239	-1.314	0.189
Social Time with Friends, P7D: 1 to 4 hours (vs. None)	-0.697	0.230	-3.028	0.002
Social Time with Friends, P7D: 5+ hours (vs. None)	-0.702	0.261	-2.685	0.007
Number of Close Friends: 1-2 (ref = None)	0.264	0.313	0.842	0.400
Number of Close Friends: 3-4	0.368	0.319	1.152	0.249
Number of Close Friends: 5 or more	0.697	0.295	2.363	0.018
GAD-2 scores	-0.049	0.052	-0.928	0.353
PHQ-2 scores	-0.076	0.054	-1.396	0.163

Note: Additional control variables included age, gender, ethnicity, income, province of residence, and survey year.

Table 6 shows results of a dominance analysis showing variable importance measures for factors associated with CPB scores. Three of the five best predictors of prevention behaviour were objective descriptions of social isolation including number of close friends (SGD=0.136), social time spent with friends (SGD=0.061) and relationship status (SGD=0.048) compared to subjective feelings of social and emotional loneliness which were ranked quite low (SGD=0.016 and SGD=0.007 respectively).

Table 6. Dominance Analysis for Factors Modeling CPB Scores

Variable	Standardized General Dominance	Rank
Year	0.590	1
Number of Close Friends	0.136	2
Social time spent with Friends	0.061	3
Province	0.051	4
Relationship Status	0.048	5
Gender	0.031	6
Income	0.030	7
Emotional Loneliness	0.016	8
Age	0.010	9
PHQ-2 Scores	0.008	10
Social Loneliness	0.007	11
GAD-2 Scores	0.006	12
Ethnicity	0.004	13
Housing Situation (Living alone)	0.002	14

In analyses aiming to determine whether greater COVID-19 behavioural compliance was associated with higher or lower self-reported changes in loneliness due to the COVID-19 pandemic, we tested whether COVID-19 Prevention Behaviour Index Scores differed across levels of self-reported changes in loneliness during COVID-19 (See Figure 1). While small differences were observed, statistical comparisons suggested that adherence to COVID-19 prevention behaviours does not systematically increase or decrease with the ordered levels of change in loneliness during COVID-19 (p=0.793).

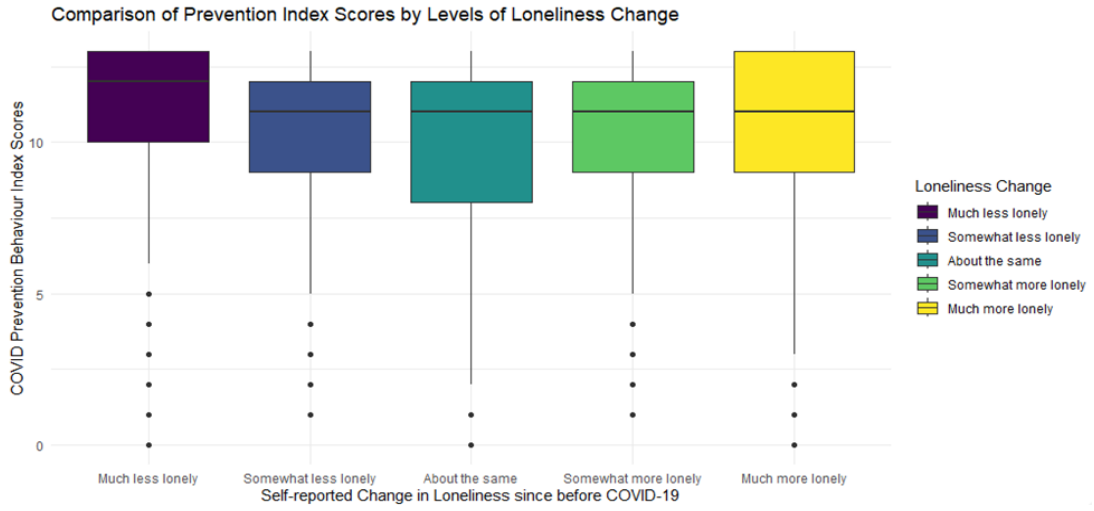

Figure 1. Comparison of COVID-19 Prevention Behaviour Index Scores by Self-Reported Changes in Loneliness During COVID-19

DISCUSSION

Primary Findings

Social and emotional loneliness were weakly but significantly correlated ($r=0.236$, $p=0.0001$) suggesting they are distinct but related concepts which aligns with previous research (Russell et al., 1984). In the multivariate model (table 5), emotional loneliness was reliably positively associated with CPB scores whereas social loneliness had no significant relationship with CPB. Spending more time with friends was associated with decreased CPB and having more friends was associated with increased CPB.

Results show that in our model, objective measures of social connection such as number of close friends, time spent with friends and relationship status were more strongly related to CPB than subjective loneliness measures (except for living alone, which was not observed to be strongly associated with compliance). This aligns with previous research showing that objective descriptions of social isolation are generally better predictors of poor health outcomes compared to loneliness (Holt-Lunstad et al., 2010; Steptoe et al., 2013).

Previous research suggests depression may mediate the relationship between loneliness and CPB since it has associations with both increased loneliness during mandated social distancing (Kobayashi, 2018; Stickley et al., 2014) and a lower health protective response (Pengpid & Peltzer, 2021; Stickley et al., 2013). Although our results show a negative association between CPB and both depression and anxiety, the association between emotional loneliness and CPB was still significant when adjusting for anxiety and depressive symptoms.

Comparisons to other Studies

Our results showing a significant positive association between emotional loneliness and prevention are consistent with research supporting the hypothesis that social distancing may increase feelings of loneliness (Choi et al., 2022; Cohn-Schwartz et al., 2022). This theory may also explain the observed positive association between prevention and time spent with friends as prevention behaviours naturally restrict social interaction. However, our sensitivity test indicates CPB scores were not different across individuals who perceived strong and weak changes in loneliness since the beginning of the COVID-19 pandemic.

Additionally, our results contradicted several previous studies which found an association between higher loneliness and decreased adherence to COVID-19 prevention behaviours (Amarat et al., 2023; Kang et al., 2021; Stickley et al., 2021; Schultz & Newman, 2023). The inconsistencies between our results and past research may be due in part to our disambiguation of emotional and social types of loneliness. The differences may also arise from the different points of time

during the pandemic in which data was collected. Indeed, aforementioned cross-sectional studies establishing an association between loneliness and prevention behaviours collected data within the first couple months of mandates (Kang et al., 2021; Stickley et al., 2021) whereas our study data was collected throughout a later stage of the pandemic. Since loneliness was observed to have increased during the implementation of mandates (Bu et al., 2020; O'Sullivan et al., 2021; Teater et al., 2021; Tull et al., 2020; van Tilburg, 2021), the effect engaging in prevention has on loneliness may be compounded by the length time in which these behaviours were practiced. Although early studies may have been able to isolate the predictive effect of loneliness on prevention behaviour, this relationship may be muddied by the effect prevention behaviour has had on loneliness.

Furthermore, baseline loneliness may predict health behaviour differently than situational loneliness originating from the COVID-19 pandemic. Chronic loneliness has been documented to be more dangerous to health than situational loneliness (Shiovitz-Ezra & Ayalon, 2010) and one study shows that pre-pandemic loneliness is more strongly associated with intention to engage in COVID-19 prevention behaviours than loneliness present during the pandemic (Kang et al., 2021). Therefore, it is possible that since this study was conducted further into the pandemic than previous studies, the loneliness captured may be contextual as opposed to chronic. Understanding nuanced trajectories of loneliness – including state and trait characteristics – may therefore be critical for understanding how individuals react to and are affected by COVID-19 prevention guidelines.

Finally, our research differentiated between how social and emotional loneliness interact with prevention behaviour which to our knowledge, no studies have yet done. There are several hypotheses to explain why emotional loneliness had a stronger association with prevention behaviour than social loneliness. One study shows that emotional loneliness increased more than social loneliness during the pandemic (van Tilburg, 2021). This may indicate that engaging in prevention is more likely to increase emotional loneliness than social loneliness. This may be due to feelings of solidarity and social integration arising in response to the shared experience of COVID-19 (Courtet et al., 2020) which has been documented to protect against social loneliness (DiTommaso & Spinner, 1997).

Limitations

Our research had several limitations. Firstly, because all data was collected at the same time, directionality between variables cannot be established. Therefore, we cannot know if the association between emotional loneliness and prevention behaviour is due to loneliness impacting engagement in prevention behaviour or vice versa. Secondly, our sample may not be representative of our target population which could hinder the generalizability of our results. Since

recruitment relied on social media, there may be demographic biases among those who saw and chose to respond to the advertisement. However, our model adjusted for demographic factors to minimize the effect of this limitation. Thirdly, the variable of prevention behaviour may not accurately reflect people's willingness to comply with regulations since compliance may be hindered by extenuating circumstances such as employment or familial obligations. Furthermore, engaging in one type of prevention behaviour may promote non-adherence to another type of prevention. For example, if someone chooses to wear a mask, they may be less willing to distance themselves from others because of the perceived protection provided by their mask.

Future Research and Implications

Future research should examine temporal sequences between loneliness and prevention behaviours to explore potential causal pathways related to these variables. Additionally, differences between the relationships social and emotional loneliness have with health protective responses should be investigated. Understanding the nuances in these relationships can inform policies that balance the need for disease prevention behaviour with social opportunity necessary for psychological wellbeing. In light of these associations, messaging strategies should consider the best approach to encourage health and minimize loneliness – particularly emotional loneliness.

CONCLUSION

Our research highlights the importance of differentiating between social and emotional loneliness when examining their relationship with prevention behaviour. The significant relationship between emotional loneliness and decreased adherence to COVID-19 prevention behaviours should be further examined as it may lead to findings which could inform policies or strategies for pandemic situations aimed to minimize loneliness and promote adherence to prevention behaviours. In particular, when considering future pandemics that may also require social distancing, attention should be paid to supporting those at risk for emotional loneliness.

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