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How did the depression and anxiety levels of older New Zealanders change during the COVID-19 pandemic?

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ABSTRACT

There has been widespread concern about the mental health impact of the global COVID-19 outbreak. Fears have been raised that depression and anxiety among older people may have increased in the pandemic, and that adverse health behaviours, such as increased alcohol use and decreased physical activity, may have contributed to the mental health decline. This study aimed to examine changes in depression, anxiety, alcohol use and physical activity scores of people aged 55 and older in New Zealand over the initial months of the pandemic. The sample included 3,171 people who responded to wave 7 (August–November 2018) and wave 8 (June–September 2020) of the Health, Work and Retirement Study. Analyses were carried out using paired *t* tests and multilevel mediation modelling. There was no evidence of significant changes in depression or anxiety. Alcohol use and physical activity were shown to decrease significantly, albeit to a small degree, and there was evidence of an indirect effect of time on depression via physical activity. These findings suggest a general resilience among older people 3 to 6 months into the pandemic. However, increased attention should be paid to promoting physical exercise among older people, as a means of decreasing depression risk.

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Physical activity; pandemic; mental health; depression; anxiety

Introduction

The COVID-19 pandemic is a global challenge that has threatened the physical health and mental wellbeing of humans worldwide. In the early days of the outbreak, serious concerns were raised by health authorities and commentators about mental health implications, particularly for older people, who faced the greatest risk of severe illness and mortality from the viral infection (Armitage & Nellums, 2020; Banerjee, 2020; Pfefferbaum & North, 2020). Literature drawn from past traumatic events (Goldmann & Galea, 2014; Neria et al., 2008), theoretical perspectives of anxiety and depression causation (Beck, 1963; Dugas et al., 1998), and age-specific factors impacting older people (Brooke & Jackson, 2020; Sepúlveda-Loyola et al., 2020), suggests that the mental health of older people may well have been negatively impacted by the COVID-19 pandemic, and

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not solely during periods of lockdown. Meta-analyses from the pandemic (Prati & Mancini, 2021; Robinson et al., 2022) indicate an initial spike in psychological distress, followed by a recovery response among most populations analysed longitudinally. Changes in mental health status also varied widely due to unique country-specific factors, like the death toll, severity of viral spread, and the presence, length and strictness of lockdowns conditions (Santomauro et al., 2021). However, to date, there is still uncertainty about the size of the effect of the pandemic, if any, on the mental health of older people.

There are several mechanisms via which the pandemic could have affected mental health. There is good reason to believe adverse health behaviours, in particular decreased physical activity and increased alcohol use, might have increased in the pandemic, and been associated with poorer mental health. Regarding physical activity, there is considerable evidence for the benefit of regular exercise across many facets of health, including anxiety and depression (Biddle, 2016; Fletcher et al., 2018). Regular physical activity produces anxiolytic effects that trigger changes in the hypothalamic-pituitary-adrenal axis and endogenous opioid system, which are concerned with stress reactivity, mood, anxiety and emotional responses (Crews & Landers, 1987). In the early days of the outbreak, there was much concern that containment strategies requiring limited movement of populations would exacerbate already low levels of physical activity (Hall et al., 2021; World Health Organization, 2020).

Likewise, there is a considerable literature suggesting that alcohol use affects mental health. A major review of the alcohol-anxiety link (Kushner et al., 2000) concluded that anxiety and alcohol use disorders are bi-directionally causal, with symptoms for each disorder interacting in a feed-forward cycle to cause comorbidity. At the outset of the COVID-19 pandemic, there was concern that global lockdowns would lead to an increase in alcohol consumption (Clay & Parker, 2020; Ramalho, 2020) and consequent effects on mental health. In particular, it was feared that the disruption and stress of COVID-19, together with lockdown requirements, would exacerbate hazardous alcohol consumption among people with anxiety and depression symptoms (Clay & Parker, 2020; Galea et al., 2020; Pfefferbaum & North, 2020).

Research undertaken during the pandemic suggests physical activity was largely curbed. A meta-analysis of 66 longitudinal studies considering physical activity changes during COVID-19 reported decreases in this health behaviour (Stockwell et al., 2021). However, many of these studies examined the pandemic only, with no pre-pandemic baseline measure. The change in alcohol use is less clear, with research from New Zealand (Every-Palmer et al., 2020) and Australia (Callinan et al., 2020) indicating consumption did not change, while studies in the United Kingdom suggest an increase (Niedzwiedz et al., 2021; Pollard et al., 2020).

Few studies investigating these health behaviour changes considered the impact on older people. Critically, those studies that examined the effect of the pandemic on older people tended to have a cross-sectional design, or data collection points during lockdowns only. Therefore, they reveal little about the effect of the pandemic on alcohol consumption and physical activity patterns, and they shed little light on whether these patterns persisted in a non-lockdown pandemic situation. Furthermore, the roles of alcohol use and physical activity have not been well explored as potential mediators that help explain the increase in mental distress that may have been experienced. This is

despite numerous studies showing strong associations between increased depression and reduced physical activity in the COVID-19 crisis (Colley et al., 2020; Duncan et al., 2020; Jacob et al., 2020; Maugeri et al., 2020). For instance, Stanton et al. (2020) found self-reported negative changes in physical activity for half of their sample of 1,491 Australian adults, and this change was associated with higher depression and anxiety symptoms.

The New Zealand Health, Work and Retirement study provides an opportunity for research on the pandemic with repeated observations over time, as biennial data collection was carried out both before and during the initial COVID-19 outbreak. It also allowed for the study of mental health change in the context of low rates of viral transmission and mortality.

The present study asked: Did depression and anxiety among older people increase, decrease or remain stable during the COVID-19 pandemic? Furthermore, did older New Zealanders drink more and exercise less during the pandemic? If so, did these changes to alcohol consumption and exercise mediate any impact of the pandemic on depression and anxiety? This research seeks to draw inferences about the impact of the pandemic as a general phenomenon, not of lockdowns per se, given the specific timing of the second data collection, not during, but following lockdown.

Materials and measures

Sample and participants

Data were drawn from the population-based longitudinal Health, Work, and Retirement (HWR) study of community-based people aged 55 and older who were selected at random from the New Zealand electoral roll, a compulsory voting register that includes over 90% of all eligible voters (Electoral Commission, 2021). The study employed a biennial design in which people who had previously participated in the survey were re-surveyed 2 years later, unless they had withdrawn or were uncontactable, had relocated overseas, or were deceased. A smaller group of new participants was selected at random through the same electoral roll method to join the study at each wave to help maintain representativeness and counteract potential attrition (for further study details, see Towers, 2006).

The final sample comprised 3,171 people who responded to both the seventh (2018) and eighth (2020) waves. This excluded 104 respondents who gave overly consistent answers or omitted 50% or more of their responses for the depression or anxiety measures (for details, see the Supporting Information). Respondents ranged in age from 55 to 91, with a mean age of 67, and 57% were women.

Data collection

The 2018 survey was treated as a pre-pandemic data point, with responses received August-December 2018. The peri-pandemic collection commenced on 11 June 2020, two weeks after New Zealand's first nationwide lockdown ended, and finished in September 2020. The surveys consisted of 120 questions in 2018 and 144 in 2020 (see Massey University, 2018, 2020), and were sent by post, with an option to complete it online.

Ethics approval was granted by the authors' institution. For further information, see Allen et al. (2019) and Towers et al. (2016).

Measures

Participants were asked to provide information on a range of demographics including gender, age and other basic socio-demographic characteristics.

Depression was assessed with the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10; Andresen et al., 1994). Items pertain to depressed mood, feelings of guilt, helplessness and worthlessness, appetite loss, sleep difficulties and psychomotor retardation. The measure employs a 4-point rating scale indicating the frequency of certain feelings in the past week. Scores range from 0–30, with scores of 10 or more considered indicative of depression. For this study the Cronbach's alpha with 2018 data was.84.

Anxiety was operationalised with a five-item Geriatric Anxiety Inventory- Short Form (GAI-SF; Byrne & Pachana, 2011), a measure of anxiety severity designed for older populations. The scale asks respondents if they agree (1) or disagree (0) with statements such as '*I worry a lot of the time*' and '*I often feel nervous*' with regard to how they have felt in the past week. The total summed score ranges from 0–5, with a score of 3 or more optimal for detecting generalised anxiety disorder in a non-clinical sample. For this study the Cronbach's alpha with 2018 data was.85.

Physical activity was assessed using a question obtained from the English Longitudinal Study of Ageing (ELSA; Hamer et al., 2014) which asked participants how frequently they did moderate intensity physical activity. Moderate intensity was selected as it is the most common intensity type for older people, and it plays a key role in promoting good health in this age group, (Booth et al., 2000; McGarrah et al., 2016; Walsh et al., 2001). Higher scores on the 1–4 scale indicated lower engagement in physical activity.

Alcohol consumption was operationalised with the Alcohol Use Disorders Identification Test-Concise (AUDIT-C; Bush et al., 1998), a brief 3-item screener for detecting risky drinking behaviours at early stages. Respondents are asked how often they drink, how many drinks they consume in a typical day and how often they have six or more drinks on one occasion, with answers on a 5-point rating scale. Total scores range from 0–12, with higher numbers indicating a greater alcohol-related risk.

Data analysis

Data analysis was undertaken using IBM SPSS Statistics version 28 and an SPSS multi-level mediation macro (Hayes & Rockwood, 2020). For information about missing data, variable transformations, and assumption checks, see the Supporting Information.

Results

T tests

Paired-samples *t* tests were conducted to determine whether there were statistically significant mean differences between 2018 and 2020 scores for depression, anxiety,

Table 1. Descriptive Statistics for Mental Health and Health Behaviour Variables Before and During the COVID-19 Pandemic.

Variable	2018 <i>M (SD)</i>	2020 <i>M (SD)</i>	<i>M_{diff}</i>	<i>d</i>	<i>t (df)</i>	<i>p</i>
Depression	6.04 (4.85)	6.16 (4.68)	0.12	0.03	1.94	.052
Anxiety	0.87 (1.47)	0.86 (1.46)	-0.01	-0.01	-0.27	.789
Physical activity	1.63 (0.95)	1.67 (0.99)	0.04	0.04	2.47	.013
Alcohol use	3.02 (2.42)	2.97 (2.44)	-0.05	-0.04	-2.13	.033

physical activity, and alcohol use. Depression and anxiety did not change significantly between the two time points, while there was a significant but very small reduction in both physical activity and alcohol use (see Table 1).

Mediation Analyses

Two multilevel mediation analyses were conducted. These models allowed us to examine whether physical activity and alcohol use mediated any relationship between time (before and after COVID-19 pandemic) and the dependent variables depression and anxiety respectively. Multilevel models were selected as they allows analysis of repeated measures; in this case, the two data points on the mediator and dependent variables for each participant. Random intercepts model were selected, in which slopes were fixed but intercepts varied across participants, thereby taking into account the dependence between observations caused by using repeated measures.

The depression model was fitted first. In this model, time was the independent variable, physical activity and alcohol use the mediators (each with both pre- and peri-pandemic measures for each participant, and depression the dependent variable (again with pre- and peri-pandemic measures for each participant). The direct effect of time on depression was positive and significant (unstandardised $c = .143$, $p = .026$, 95% CI [0.017, 0.268]). The indirect effect of time (pre/post pandemic) on depression through physical activity was positive and significant, unstandardised $a1b1 = .019$, $p = .022$, 95% CI [0.004, 0.036]. However, the indirect effect of time via alcohol use was not significant, unstandardised $a2b2 = -.002$, $p = .471$, 95% CI [-.009, 0.003]. Results of the analysis are presented in Figures 1.

For the anxiety model, the direct effect of time on anxiety was negative and not significant (unstandardised $c = -.019$, $p = .426$, 95% CI [-0.066, 0.028]) when the effect of physical activity was controlled for. The indirect effects for both alcohol use and physical activity were non-significant. Results are presented in Figures 2.

Discussion

Our results show no evidence that depression or anxiety symptoms increased among older New Zealanders in the pandemic. That depression and anxiety did *not* increase in this population, despite the magnitude, unpredictability and deadliness of the fast-unfolding global pandemic in mid-2020, is remarkable. This finding aligns with those of other New Zealand longitudinal studies (Bulbulia et al., 2020; Law et al., 2022; Sibley et al., 2020). It also suggests a resilience among older people. Some literature suggests that

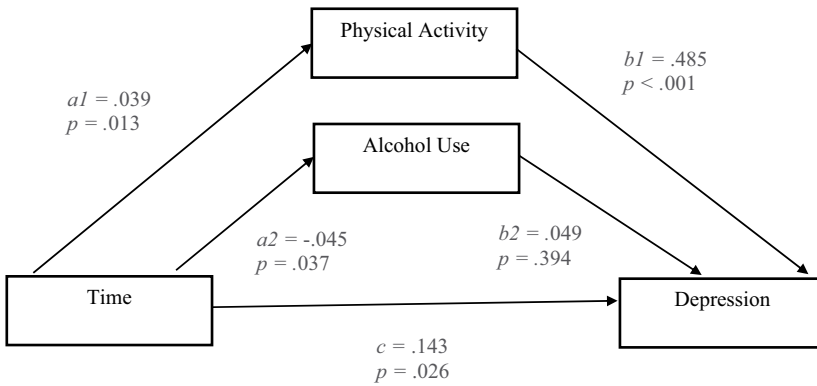


Figure 1. Unstandardised Regression Coefficients for the Relationship Between Time and Depression as Mediated by Alcohol Use and Physical Activity (N = 3,171). Note: There was a significant indirect effect of time (pre – to peri – pandemic) on depression through physical activity, unstandardised $a1b1 = .019$, $p = .022$, 95% CI [0.004, 0.036]. There was no significant indirect effect of time (pre – to peri – pandemic) on depression through alcohol use, unstandardised $a2b2 = -.002$, $p = .471$, 95% CI [-0.009, 0.003]. Covariance matrix: Unstructured. Random intercepts were specified for both mediators and the dependent variable

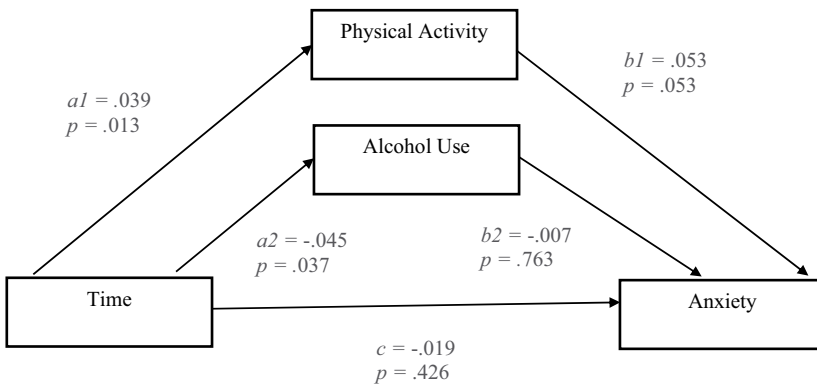


Figure 2. Unstandardised Regression Coefficients for the Relationship Between Time and Anxiety as Mediated by Alcohol Use and Physical Activity (N = 3,171). Note: There was no significant indirect effect of time (pre – to peri – pandemic) on anxiety through physical activity, unstandardised $a1b1 = .002$, $p = .146$, 95% CI [-0.000, 0.005]. There was also no significant indirect effect of time (pre – to peri – pandemic) on anxiety through alcohol use, unstandardised $a2b2 = 0.000$, $p = .788$, 95% CI [-0.002, 0.003]. Random intercepts were specified for both mediators and the dependent variable. Covariance matrix: Unstructured.

older people’s life experiences in overcoming adversities increase resilience, wisdom and ability to cope in difficult times (Eshel et al., 2016; van Kessel, 2013). Indeed, research comparing older and younger cohorts in the pandemic (Every-Palmer et al., 2020; Kwong et al., 2020; Pierce et al., 2020) almost universally found older people had comparatively lower increases in mental distress.

Alcohol Use

Results showed that, contrary to suggestions, older New Zealanders drank less alcohol, not more, during the early months of the pandemic, although the effect was very small. This is in line with New Zealand research from Every-Palmer et al. (2020) in which participants self-reported no overall change in drinking patterns in lockdown compared with pre-lockdown. Another international study that reported a reduction, Kilian et al. (2021), pointed to decreased beverage availability and increased distress, two explanations that do not appear relevant to the present study, given there was no significant mental health change, and alcohol remained widely available in New Zealand (Huckle et al., 2020). Of course, it is possible that a proportion of older New Zealanders were less familiar with online alcohol sales channels routinely used by generally younger patrons. The reduction could also reflect a reluctance among older people to return to social drinking venues like bars, restaurants, Returned Services Associations, and sports clubs in the wake of lockdown.

Physical Activity

Physical activity decreased between the two time points, albeit only slightly. This reduction aligns with the finding of a systematic review of 66 longitudinal studies on physical activity in the pandemic (Stockwell et al., 2021). It is also in keeping with longitudinal data collected at two time points in the pandemic (Vogel et al., 2021) showing physical activity remained reduced beyond lockdown.

This result suggests people who reduced or stopped exercising while staying at home did not resume all activity even after facilities and socialising had recommenced, possibly because the key habitual aspect of physical activity was disrupted (Kaushal et al., 2017). Importantly, the reduction was small, which perhaps reflects some resumption of physical activities like group exercise classes and walking with friends, since strict stay-at-home orders were lifted. Of course, it is also feasible that lockdown may not have caused a substantial decrease in physical activity among older people in the first place, as some studies suggest (McCarthy et al., 2021; Smith et al., 2020).

Findings from the mediation analysis showed physical activity partially mediated the effect of time (pre vs. peri-pandemic) on depression, but not anxiety. This suggests that despite the lack of evidence of an overall increase in depression scores over time, there was some evidence of an indirect effect of time on depression scores via physical activity. Some literature indicates that a significance test of an indirect effect can have higher power than one of the total effect and, as such, mediation can be cautiously interpreted where evidence of a total effect is lacking (O'Rourke & MacKinnon, 2015). However, others warn against such interpretation (Loeys et al., 2015). Future research is required to determine whether this indirect effect is replicable and robust to causal identification strategies.

Implications

While mental distress did not increase significantly in general, our results did suggest older individuals who were less physically active during the outbreak may have a

heightened depression risk. This finding reinforces the growing recognition of the strong association between physical activity and depression, both in ‘normal life’ (Rebar et al., 2015), and during COVID-19 (Stockwell et al., 2021). It suggests increased attention could be paid to promoting physical exercise among older people as a means of decreasing depression risk (both within and outside of pandemic).

At the time of writing, COVID-19 continues to be transmitted in the community, but is no longer classed as a public health emergency (World Health Organization, 2023). Yet pandemics and other global emergencies will no doubt occur again in future, and the question of what actions are warranted to mitigate transmission will surely arise again. This is not a question that psychological research alone can answer. However, our findings, along with international studies of the effect of lockdowns (e.g., Prati & Mancini, 2021), suggest that substantial policy changes to prevent infection may not necessarily exert a rapid and substantial effect on mental health. This is a positive message: It suggests that one potential side effect of such policies might *not* be as severe as many have feared.

Limitations

The use of two waves of observations allowed us to describe changes (or the lack thereof) over time, but we cannot make confident causal inferences about the effect of the COVID-19 pandemic given that many other factors (e.g., other historical events, maturation) may have produced changes in our participants’ scores. Furthermore, while the mediational analyses we reported allowed us to broadly test the consistency of our observations with possible causal mechanisms, they do not permit strong causal inferences. As would be the case in a cross-sectional analysis, these mediational analyses are vulnerable to the possibility of effects from the dependent variables to the mediators, or of time-invariant and time-variant confounding variables.

Furthermore, as data collection occurred after lockdown this study cannot be used to draw inferences about the impact of lockdowns per se. Additionally, the COVID-19 pandemic was still unfolding at the time of our second wave of data collection, with populations responding to the unique factors they face at the precise time and place of data collection. Thus, these results should be viewed as a snapshot in time and not a reflection of ongoing resilience. Finally, as the study was a secondary analysis of existing data, some HWR variables were less fit for purpose. No validated measure for physical activity was available, so the moderate physical activity variable selected had uncertain validity and reliability and a higher proportion of missing data than would be the case had the survey been built for purpose.

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