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Mental well-being and physical activity of young people experiencing homelessness before and during COVID-19 lockdown: A longitudinal study

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ABSTRACT

Background: While lockdown restrictions in response to COVID-19 indisputably mitigated virus transmission, the aim of this longitudinal study was to establish indirect effects on vulnerable young people's mental well-being and physical activity (PA) levels.

Methods: Surveys conducted at time 1 (February 2020), and time 2 (April 2020) comprised of the short Warwick Edinburgh Mental Well-Being Scale, the Rosenberg Self-Esteem Scale, and self-reported moderate and vigorous PA levels. Repeated measures analyses established changes pre-post lockdown restrictions, and differences between sub-groups. Associations between changes in well-being, self-esteem and PA over time were explored through further regression analyses.

Results: 65 respondents completed the survey at time 1, and 50 respondent at time 2. Wellbeing increased significantly over time, yet remained significantly lower than the population average. Self-esteem increased significantly post-lockdown, however remained significantly lower for females, compared with males. Overall, PA levels increased-whereby 'inactive' participants at time 1 reported significant increases in moderate and total activity levels at time 2. Increased PA levels significantly predicted increased well-being: $F(1, 48) = 4.15$, $p < .05$; while participants who had become *less* active accounted for 69.2% with low self-esteem at time 2.

Conclusions: Findings indicate that increased PA accounted for improved mental well-being, while decreased PA was associated with reduced levels of self-esteem. PA may represent a modifiable means of mitigating risk, and promoting resilience for vulnerable young people experiencing adverse conditions.

1. Introduction

March 23rd, 2020 signified the UK government's introduction and enforcement of strict measures and guidance in response to the prevailing COVID-19 pandemic. While the direct effectiveness of these measures on reducing COVID-19 transmission may be indisputable, the *indirect* impact of factors known to initiate or exacerbate poor mental health and well-being (i.e. isolation, sedentary behaviour)—particularly in the most vulnerable groups—remains largely unknown, and therefore constitutes an urgent research priority (Holmes et al., 2020).

Recent cross-sectional studies indicate that younger people (particularly females) of low socioeconomic status (SES), have reported significantly higher rates of poor mental health since the COVID-19 pandemic (Smith et al., 2020), with health-related behaviours (i.e. physical inactivity, poor sleep quality) significantly contributing to increases in psychological distress (Faulkner et al., 2021). Preliminary findings from longitudinal research conducted over 2 weeks of 'lockdown' specifically identified physical activity (PA) as a predictive factor of physical health, whereas increased sedentary behaviour was associated with poorer physical and mental health (Cheval et al., 2021). Interestingly, there is further evidence to suggests that positive effects associated with increased PA may be amplified in individuals who—prior to lockdown—were classified as 'inactive' (Lesser & Nienhuis, 2020). Taken together, this evidence reinforces the notion that modifiable factors (such as PA), may promote resilience to sustain psychological well-being, despite stressful and adverse socio-ecological conditions (Ungar & Theron, 2020).

Young people (aged 16–24) frequently fail to meet current recommended levels of PA for their age (Department of Health and Social Care, 2019), with lowest levels often reported amongst the most disadvantaged groups (Bruce et al., 2019). For those experiencing homelessness, the interplay between PA levels, physical health, and psychological well-being (see Kandola et al., 2019) may be exacerbated by a disproportionately high prevalence of mental illness compared with

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population 'norms' (Hodgson et al., 2014). Conversely, engagement in PA has been reported to extenuate the relationship between traumatic or adverse experiences in childhood, and subsequent onset of poor mental health (Hughes et al., 2018)- suggesting that PA could moderate the impact of COVID-19 restrictions on these individuals' mental health and well-being. Indeed, amid the pandemic 'social isolation' has been recently cited as the major concern for people with lived experience of mental illness, whereas 'connectedness' and 'outdoor PA' offered effective coping strategies to maintain mental health and well-being (Cowan, 2020).

While the present study was originally intended to determine changes in well-being and PA levels of young people experiencing homelessness (YPEH) over 8-weeks of 'usual care', its coincidence with the COVID-19 pandemic presented a unique opportunity to obtain data prior to, and during government-imposed restrictions. Unlike previous research designs outlined above, this longitudinal study aims to explore how social restrictions and isolation have impacted on the mental health and well-being of YPEH, analyse pre-post 'lockdown' changes in symptoms, and discuss findings within the context of identified risk (i.e. gender) and protective (i.e. physical activity) factors.

2. Methods

2.1. Design and participants

This longitudinal study was designed to assess changes in well-being, self-esteem and physical activity levels occurring over an 8-weeks period (4 weeks before, and 4 weeks after introduction of lockdown restrictions). Ethical approval was granted by Cardiff Metropolitan University School of Health Sciences Ethics Committee (Ref: PGR-2477).

Purposive sampling was used to recruit participants through the charity Llamau (www.llamau.org.uk), which provides supported accommodation and alternative education to YPEH. Eligibility criteria required participants to be aged between 16 and 24 years, with capacity to understand the study aims and procedures, and to provide written consent. Data collection of survey one was completed over one week, from 21st February 2020 (T1), and for survey two over one week, from Friday 17th April 2020 (T2).

2.2. Procedures

Participants were asked to complete paper-based surveys at T1, either under the supervision of the lead researcher (JT), organisation staff, or both. As lockdown measures were imposed mid-way through the data collection period (March 23rd, 2020), follow-up surveys (T2) were all completed remotely, either via phone calls between the lead researcher and participant, or through posting and e-mailing via staff. Participants who completed surveys at both T1 and T2 were sent a £10 voucher for their time.

2.3. Outcome measures

Demographic data included age (16–18; 19–21; 22–24), gender (male; female; other; prefer not to say), level of education (primary; secondary; college/sixth form; university) and employment status (full-time employed; part-time employed; full-time education; part-time education; training/apprenticeship; none of the above).

Mental well-being was measured using the Short Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS; Stewart–Brown et al., 2009), consisting of seven positively worded statements, which are summed to provide an overall score (between 7 and 35). Established national norms (23.6) provided a benchmark for comparison of sample scores with general population data (Fat et al., 2017).

Self-esteem was measured using the Rosenberg Self-Esteem Scale (SES; Rosenberg, 1965), comprising 10 positively or negatively framed items. Overall scores were used to indicate low (<15), medium (15–25), or high (>25) self-esteem.

Participants were asked to self-report the number of days, and minutes per day they had engaged in physical activity "over the past 7 days" for moderate, and vigorous types of activities. Composite levels of activity were calculated to ascertain whether recommended levels for age categories were met (16–18 = >60 min moderate-vigorous per day; 19–24 = >150 min moderate per week, or >75 min vigorous per week; Department of Health and Social Care, 2019).

2.4. Statistical analysis

Data was analysed using SPSS Version 24.0 (IBM Corp., 2016). Descriptive statistics included frequencies and percentages of categorical variables, while mean scores and standard deviations (SD) were generated for continuous data. Outcome variables were computed into sub-groups (low/medium/high self-esteem; above/below average well-being; meet/don't meet PA levels for age) to allow chi-squared analysis between demographic groups, and independent *t*-tests were conducted to establish group differences at both T1 and T2. Paired-samples *t*-tests (two-tailed) were used to determine any significant differences ($p < .05$) and effect sizes (Cohen's *d*) of outcome variables between T1 and T2, and mixed-factorial ANOVA's to compare pre-post lockdown differences on outcomes between various groups (i.e. gender, meet PA).

Linear and multiple linear regression tests were conducted to investigate associations between overall change in outcome variables over time, and whether adding categorical variables to the model (i.e. gender, meet PA) improved the overall fit. Pearson's correlation coefficient (*r*) was utilised to denote strength of associations, and adjusted R-squared reported for the proportion variance in outcome variables attributable to the predictor variables.

3. Results

65 respondents completed the survey at T1, constituting a 70% participation rate. Lack of availability and unwillingness to complete the survey were cited as principal barriers to participation. T2 data was obtained from 50/65 participants (77%), with reasons for loss to follow-up including: moved on from service ($n = 7$) unable to contact ($n = 4$); refusal to complete survey 2 ($n = 3$); and incarceration ($n = 1$). Participants' demographic information at each timepoint is presented in Table 1.

3.1. Pre-lockdown baseline data (Time 1)

81.5% of participants reported below-average levels of mental well-

Table 1
Participant characteristics at Time 1 and Time 2.

	Time 1 ($N = 65$) *N* (%)	Time 2 ($N = 50$) *N* (%)
Gender		
Male	34 (52.3)	24 (48)
Female	30 (46.2)	25 (50)
Other	1 (1.5)	1 (2)
Age		
16–18	46 (70.8)	33 (66)
19–21	19 (29.2)	17 (34)
Education		
Primary School	10 (15.4)	9 (18)
Secondary School	37 (56.9)	27 (54)
College/Sixth Form	18 (27.7)	14 (28)
Employment		
Part-time Employed	1 (1.5)	1 (2)
Full-time Education	15 (23.1)	14 (28)
Part-time Education	3 (4.6)	3 (6)
Training/Apprenticeship	21 (32.3)	16 (32)
None	25 (38.5)	16 (32)

being, compared with the general population mean (23.6), and this difference was statistically significant ($t = -7.48$, df = 64, $p < .001$, $d = 0.93$). Independent samples *t*-tests confirmed no further significant differences when comparing groups by gender or age.

35.4% of participants reported low self-esteem levels (<15), with independent samples *t*-tests showing that females reported significantly lower scores compared to males ($MD = 2.87$, $t = 2.19$, df = 62, $p < .05$). An exact significance test for Pearson's chi-square found a relationship between low self-esteem and participants aged 16–18 years: $\chi^2(2) = 6.61$, exact $p = .033$).

70.8% of participants were 'inactive'; i.e. did not meet recommended levels for their age, while males represented 73.7% of all 'active' participants.

3.2. Post-lockdown follow-up data (Time 2)

Table 2 details well-being, self-esteem, and PA levels between T1 and T2.

Well-being levels significantly increased between T1 and T2 ($t = 2.26$, df = 49, $p < .05$, $d = 0.36$), however average scores remained significantly lower than the general population mean ($t = -3.46$, df = 49, $p = .001$). Positive effects were observed regardless of gender or age, and there were no further significant differences within or between these groups.

Self-esteem levels had improved since T1 ($M = 17.58$, SD = 5.49), with paired samples *t*-tests showing that this change was significant ($t = 2.16$, df = 49, $p < .05$, $d = 0.28$). There was no longer an association between younger participants and low self-esteem, with those aged 16–18 years reporting a significant increase since T1 ($MD = 1.94$, $t = -2.09$, df = 32, $p < .05$), however levels remained significantly lower for females compared to males at T2 ($MD = 3.33$, $t = 2.19$, df = 47, $p < .05$).

Increases were observed across moderate ($MD = 85.91$ min), vigorous ($MD = 10.24$ min) and total ($MD = 96.15$ min) PA levels, with a slight increase (+2.8%) in the number of participants meeting guidelines for their age. There was less variation between genders than that observed at T1, with females representing 43.8% of this group.

Compared to T1, 'inactive' participants significantly increased levels of moderate PA ($MD = 149.36$, 95% CI [233.64, 65.07], $t(37) = 3.59$, $p = .001$, $d = 0.58$), and total PA ($MD = 172.72$, 95% CI [272.30, 73.15], $t(37) = 3.56$, $p = .001$, $d = 0.57$), whereas the opposite was observed for initially 'active' participants who reported decreased levels in PA over time. The change in PA between initially 'active' and 'inactive' participants was significantly different for both moderate ($MD = 264.36$, 95% CI [470.46, 58.25], $t(48) = 2.58$, $p = .013$, $d = 0.73$) and total ($MD = 319.06$, 95% CI [533.92, 104.19], $t(48) = 2.99$, $p = .004$, $d = 0.93$) minutes per week, and increased PA over time was significantly greater in participants considered 'inactive' at T1, compared to the 'active' group: $F(1,37) = 12.35$, $p = .001$, $\eta p^2 = 0.25$ (Fig. 1).

Table 2
Well-being, Self-esteem, and Physical Activity Levels reported at Time 1 and Time 2.

Variable	Time 1 ($N = 65$)	Time 2 ($N = 50$)	*MD*
Well-being			
Mean (SD)	**20.20 (3.66)**	**21.55 (4.19)**	**+ 1.35***
Below Average (%)	81.5%	72%	−9.5%
Above Average (%)	18.5%	28%	+9.5%
Self-Esteem			
Mean (SD)	**15.83 (5.37)**	**17.58 (5.49)**	**+ 1.75***
Low (%)	35.4%	26%	−9.4%
Medium (%)	61.5%	66%	+4.5%
High (%)	3.1%	8%	+4.9%
Meet PA Levels			
Yes (%)	29.2%	32%	+2.8%
No (%)	70.8%	68%	−2.8%

Note: *$p < .05$.

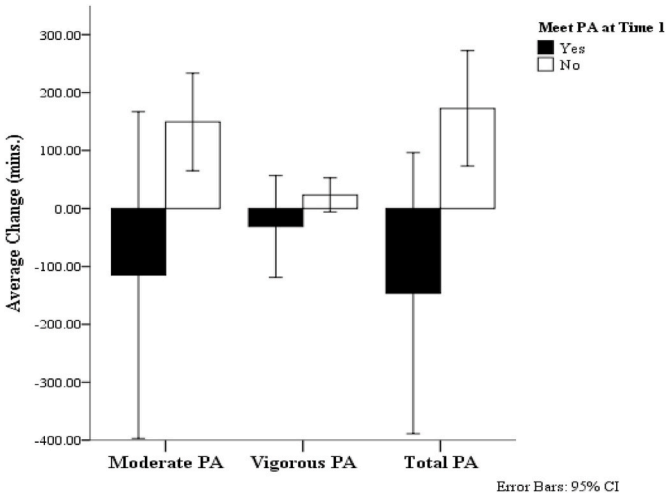

Fig. 1. Physical Activity change over time based on level of activity at time 1.

3.3. Associations between PA and well-being

Changes in well-being were positively associated with changes in moderate PA: $r(48) = 0.24$, $p < .05$, and total PA: $r(48) = 0.28$, $p < .05$ between T1 and T2. The association between well-being change and vigorous PA change was not statistically significant. Participants who had increased their PA levels since T1 accounted for 71.4% of those with above average well-being levels at T2.

Further analysis established that increased total PA levels over time significantly predicted increased well-being: $F(1, 48) = 4.15$, $p < .05$, accounting for 6% of the variance in well-being scores from T1 to T2 ($R^2 = 0.79$, adj. $R^2 = 0.60$) (Fig. 2).

3.4. Associations between PA and self-esteem

There were no statistically significant associations between changes in overall PA levels and self-esteem scores: $F(1, 48) = 0.015$, $p = .90$, or changes in moderate and vigorous PA levels and self-esteem scores: $F(2,47) = 0.015$, $p = .99$, adj. $R^2 = -0.042$.

Chi-square analyses showed a significant association between self-esteem levels at T2 and change in PA levels over time $\chi^2(2) = 8.28$, exact $p = .012$, with participants who had become less active accounting

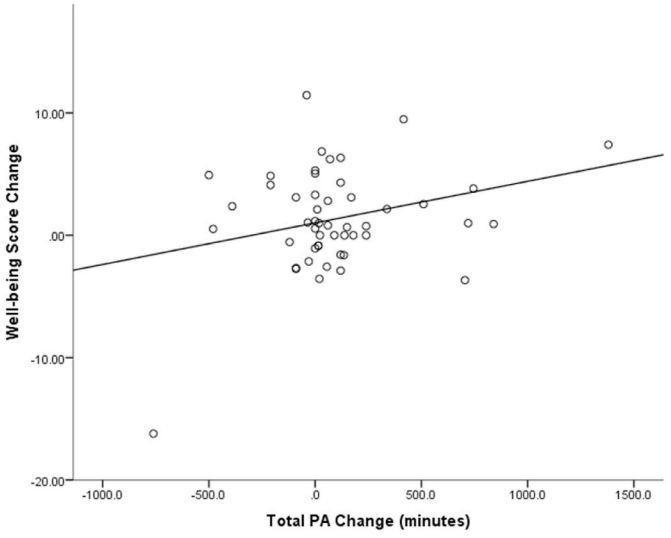

Fig. 2. Linear regression between change in physical activity levels and change in well-being scores.

for 69.2% of those with low self-esteem.

4. Discussion

This longitudinal study provided an insight into how the COVID-19 pandemic has affected YPEH from pre-post enforced lockdown restrictions. Findings presented are somewhat unique, compared with studies which have relied on retrospective recall, cross-sectional associations, or longitudinal analysis *after* lockdown (i.e. no 'usual' baseline comparison).

Contrary to expected findings, participants in the current study reported *improvements* across all outcome measures, 4-week after the introduction of lockdown restrictions in response to COVID-19. Despite multiple aspects contributing to the potential vulnerability of this group (i.e. young people, existing mental health issues, socially excluded, low SES; see Holmes et al., 2020), these findings indicate a presence of resilience factors as moderators of positive outcomes, despite the potential challenges and risk. As a frequently marginalised and excluded group, it is plausible that the enforcement of restrictions across *all* populations may have promoted a sense of connectedness and belonging, thus mitigating the impact of social isolation (Loades et al., 2020). As an outcome related to resilience, this may also explain the significant improvement in self-esteem levels amongst younger participants (Ungar, 2019); for whom reduced social contact may present the greatest threat to mental well-being under lockdown conditions (Smith et al., 2020).

Although evidence-based, the above explanations are purely speculative in the context of the present study. Conversely, the inclusion of PA as a primary outcome measure offers insight into the impact of lockdown restrictions on overall pre-post levels of PA, as well as how changes in these levels are associated with participants' mental well-being. Findings presented strongly indicate that the enforced restrictions introduced mid-study contributed to the increase in PA levels observed over time. While the proportion of participants meeting PA guidelines remained relatively low (32%), these findings are encouraging when considering the psychosocial barriers to PA engagement often experienced by these individuals (Bruce et al., 2019). Of particular importance is the reduced gender disparity observed at T1-with females increasing PA levels more than males over time, hence contributing to their proportional representation of 'active' participants at T2. This would imply that lockdown presented an *opportunity* for females specifically to engage in PA-possibly through the subsequent surge in 'acceptable' activities such as walking or cycling, and substantiates recent cross-sectional research evidencing a similar trend (Faulkner et al., 2021). The implications of these findings should not be underestimated in the context of informing effective policies to support 'high-risk' groups (i.e. young females) through this, and potentially future crises (Sallis et al., 2020).

The significant increase in PA levels over time reported by initially 'inactive' individuals may appear counterintuitive to the relatively marginal increase in the proportion of participants meeting PA guidelines (2.8%). Although not measured as an outcome in this study, it may be more accurate and informative to interpret these findings as a decrease in sedentary behaviour over time, rather than regarding these participants as 'active'. Similarly, the overall decrease in PA over time reported by initially 'active' individuals insinuates that despite restrictions around their usual habits (i.e. closure of gyms) impacting on their 'exercise' regime, most were willing to adapt, and find alternative means to remain 'active' (albeit to a lesser degree). From a public health perspective, this raises the importance of tailoring PA promotion during lockdown according to population sub-groups (Sallis et al., 2020), and avoiding conflation or interchangeable use of PA-related terminology.

The association between increased PA and mental well-being demonstrated in the present study is concurrent with a wide body of previous literature (e.g. Kandola et al., 2019), and findings in the context of COVID-19 (Lesser & Nienhuis, 2020; Faulkner et al., 2021). In contrast to previous findings, the longitudinal design of this study allowed examination of changes in outcome measures from pre-post lockdown restrictions, and therefore establish that increased PA positively contributed to participants' mental well-being. It can also be inferred that PA represents a *modifiable* means of mitigating risk, and protecting well-being through promoting resilience under adverse conditions (Ungar, 2019). The lack of association between PA and self-esteem was somewhat surprising, yet supportive of previous reviews (Biddle et al., 2019), and ostensibly suggests that factors unrelated to PA may have accounted for observed improvement over time. Nonetheless, the relationship between decreased levels of PA and low self-esteem at T2, reinforces the importance of regarding sedentary behaviour as a discrete variable which may effectuate change through distinct pathways to PA (see Vancampfort et al., 2017).

Despite the positive aspects of the present study, it is not without limitations. Although increased PA levels were causally associated with improved mental well-being over time, effect sizes and proportion of variance were relatively small, indicating that numerous other (unmeasured) factors contributed to the observed effects. This study adds to the limited base of longitudinal research assessing the impact of COVID-19, however the relatively short period post-lockdown (4-weeks) may not reflect the effect of prolonged social isolation on outcome trajectories over time (Loades et al., 2020). While sample size and loss to follow-up may compromise generalisability of this study's findings, participants recruited were entirely representative of the target population (i.e. young people experiencing homelessness), who are often considered as 'hard-to-reach' under *usual* circumstances (Kidd et al., 2018). Moreover, he accrual of longitudinal data during this period is conducive to calls for prioritising research which addresses the impact of COVID-19 on vulnerable groups (Holmes et al., 2020), and offers additional potential for translation into effective PA interventions to mitigate future adversity and negative effects (Sallis et al., 2020).

Role of funding

Funders were not involved in study design; in the collection, analysis, and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication. The lead author (JT) had full access to all the data in the study, and final responsibility for the decision to submit for publication.

Contributors

JT conceived and designed the study under supervision of NB, RM, and KT. JT collected and analysed all data, and produced all figures. JT, NB, RM, and KT interpreted the data in the context of existing literature. JT composed the original manuscript, and all authors contributed to and approved the final version.

Declaration of competing interest

All authors declare no competing interests.

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References

Biddle, S. J., Ciaccioni, S., Thomas, G., & Vergeer, I. (2019). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of Sport and Exercise, 42*, 146–155.

Bruce, L., Pizzirani, B., Green, R., Quarmby, T., O'Donnell, R., Strickland, D., & Skouteris, H. (2019). Physical activity engagement among young people living in the care system: A narrative review of the literature. *Children and Youth Services Review, 103*, 218–225.

Cheval, B., Sivaramakrishnan, H., Maltagliati, S., Fessler, L., Forestier, C., Sarrazin, P., Orsholits, D., Chalabaev, A., Sander, D., Ntoumanis, N., & Boisgontier, M. P. (2021). Relationships between changes in self-reported physical activity, sedentary behaviour and health during the coronavirus (COVID-19) pandemic in France and Switzerland. *Journal of Sports Sciences, 39*(6), 699–704. https://doi.org/10.1080/02640414.2020.1841396

Cowan, K. (2020). Survey results: Understanding people's concerns about the mental health impacts of the COVID–19 pandemic. In *MQ: Transforming mental health and the academy of medical Sciences*. Retrieved from https://acmedsci.ac.uk/file–download/99436893.

Department of Health and Social Care. (2019). UK chief medical officers' physical activity guidelines. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/832868/uk–chief–medical–officers–physical–activity–guidelines.pdf.

Fat, L. N., Scholes, S., Boniface, S., Mindell, J., & Stewart-Brown, S. (2017). Evaluating and establishing national norms for mental wellbeing using the short warwick–edinburgh mental well-being scale (SWEMWBS): Findings from the health survey for england. *Quality of Life Research, 26*(5), 1129–1144.

Faulkner, J., O'Brien, W. J., McGrane, B., Wadsworth, D., Batten, J., Askew, C. D., … Lambrick, D. (2021). Physical activity, mental health and well-being of adults during initial COVID-19 containment strategies: A multi-country cross-sectional analysis. *Journal of Science and Medicine in Sport, 24*(4), 320–326.

Hodgson, K. J., Shelton, K. H., & van den Bree, M. B. (2014). Mental health problems in young people with experiences of homelessness and the relationship with health service use: A follow–up study. *Evidence-Based Mental Health, 17*, 76–80.

Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Silver, R. C., Everall, I., & Ford, T. (2020). Multidisciplinary research priorities for the COVID–19 pandemic: A call for action for mental health science. *The Lancet Psychiatry, 7*, 547–560.

Hughes, K., Ford, K., Davies, A., Homolova, L., & Bellis, M. (2018). *Sources of resilience and their moderating relationships with harms from adverse childhood experiences*. Public Health Wales NHS Trust. Retrieved from https://www.wales.nhs.uk/sitesplus/documents/888/ACE%20&%20Resilience%20Report%20(Eng_final2).pdf.

IBM Corp. (2016). *IBM SPSS statistics for windows*. Armonk, NY: IBM Corp Version 24.0. .

Kandola, A., Ashdown–Franks, G., Hendrikse, J., Sabiston, C. M., & Stubbs, B. (2019). Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neuroscience & Biobehavioral Reviews, 107*, 525–539.

Kidd, S., Slesnick, N., Frederick, T., Karabanow, J., & Gaetz, S. A. (2018). *Mental health & addiction interventions for youth experiencing homelessness: Practical strategies for front–line providers*. Canadian Observatory on Homeless Press. Retrieved from https://homelesshub.ca/sites/default/files/COH–MentalHealthBook.pdf.

Lesser, I. A., & Nienhuis, C. P. (2020). The impact of COVID–19 on physical activity behavior and well–being of Canadians. *International Journal of Environmental Research and Public Health, 17*. https://doi.org/10.3390/ijerph17113899. Article e3899.

Loades, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., Linney, C., McManus, M. N., Borwick, C., & Crawley, E. (2020). Rapid systematic review: The impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. *Journal of the American Academy of Child & Adolescent Psychiatry, 59*(11), 1218–1239. https://doi.org/10.1016/j.jaac.2020.05.009

Rosenberg, M. (1965). *Society and the adolescent self–image*. Princeton: University Press.

Sallis, J. F., Adlakha, D., Oyeyemi, A., & Salvo, D. (2020). An international physical activity and public health research agenda to inform COVID–19 policies and practices. *Journal of Sport and Health Science*. https://doi.org/10.1016/j.jshs.2020.05.005 [Preprint].

Smith, L., Jacob, L., Yakkundi, A., McDermott, D., Armstrong, N. C., Barnett, Y., López–Sánchez, G. F., Martin, S., Butler, L., & Tully, M. A. (2020). Correlates of symptoms of anxiety and depression and mental wellbeing associated with COVID–19: A cross–sectional study of UK–based respondents. *Psychiatry Research, 291*. https://doi.org/10.1016/j.psychres.2020.113138. Article e113138.

Stewart–Brown, S., Tennant, A., Tennant, R., Platt, S., Parkinson, J., & Weich, S. (2009). Internal construct validity of the warwick–edinburgh mental well–being scale (WEMWBS): A rasch analysis using data from the scottish health education population survey. *Health and Quality of Life Outcomes, 7*. https://doi.org/10.1186/1477–7525–7–15

Ungar, M. (2019). Designing resilience research: Using multiple methods to investigate risk exposure, promotive and protective processes, and contextually relevant outcomes for children and youth. *Child Abuse & Neglect, 96*. https://doi.org/10.1016/j.chiabu.2019.104098. Article e104098.

Ungar, M., & Theron, L. (2020). Resilience and mental health: How multisystemic processes contribute to positive outcomes. *The Lancet Psychiatry, 7*, 441–448.

Vancampfort, D., Firth, J., Schuch, F. B., Rosenbaum, S., Mugisha, J., Hallgren, M., Probst, M., Ward, P. B., Gaughran, F., De Hert, M., & Carvalho, A. F. (2017). Sedentary behavior and physical activity levels in people with schizophrenia, bipolar disorder and major depressive disorder: A global systematic review and meta-analysis. *World Psychiatry, 16*, 308–315.