

The Stimulus of Physical Activity, Exercise Motives, and Sports Engagements to Improve Sportsman Mental Health: A Quantitative Study on Canadian Universities

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Abstract

The objective of this study is to examine the associations between physical activity, exercise motivations, sports participation, and mental well-being among university students in Canada. A quantitative research approach was utilised in this study, employing a cross-sectional design and a convenient sampling method. Data were collected from a sample of 500 students enrolled in sports universities. The collected data were then analysed using SPSS software. The study revealed a noteworthy positive correlation between physical activity, exercise motivations, sports involvement, and mental well-being. In particular, there exists a positive association between elevated levels of physical activity (PA), heightened exercise motivations, and increased involvement in sports with improved outcomes in mental health. The results of multiple regression analyses demonstrated that the combination of these three factors accounted for a significant proportion of the variability observed in mental health scores, underscoring their significance in fostering psychological well-being. The results of the study have practical implications for universities in Canada. In order to optimise the welfare of students, educational institutions should give precedence to implementing strategies that foster physical activity within campus premises, facilitate the cultivation of robust exercise motivations, and advocate for active participation in sports. Establishing an atmosphere conducive to mental well-being and comprehensive growth has the potential to enhance the overall academic achievement of students. Additionally, it has been proposed that the research indicators may elicit the release of neurotransmitters such as endorphins and serotonin within the brain, which are known to contribute to an enhanced emotional state. Additionally, it has the potential to enhance one's physical fitness, thereby contributing to an elevated emotional state.

Keywords: physical activity (PA), exercise motives, sports engagement, mental health, students, Canada.

Introduction

The concept of mental health, which pertains to an individual's psychological and emotional well-being, holds significant importance in the context of overall wellness (Abrantes et al., 2022). The intricate interplay between social and biological factors has an impact on the shaping of this phenomenon (Chow & Choi, 2019). The World Health Organisation has provided a definition of mental health as the condition in which an individual is able to recognise and fulfil their capabilities, effectively manage the challenges of life, maintain productivity, and make positive contributions to their community (Abrantes et al., 2022). Nevertheless, Pascoe et al. (2020) have expressed additional apprehensions by highlighting the projected prevalence of mental health issues surpassing other sources of impairment among young individuals in developed countries such as Canada. Hence, it is imperative within the Canadian context to prioritise the promotion of mental health awareness and the prevention of mental disorders.

Existing literature has demonstrated that engaging in physical activity (PA), having exercise motives, and participating in sports have a significant impact on enhancing mental well-being (Congsheng, Kayani, & Khalid, 2022).

Numerous studies have underscored the considerable impact of physical activity (PA) and participation in sports on the improvement of mental well-being throughout various phases of life (Tamminen et al., 2020; Tiaotrakul, Koeipakvaen, & Sertbudra, 2019). Physical activity (PA) can manifest in different ways, encompassing both unplanned engagements such as leisure activities, work-related obligations, and commuting, as well as structured physical exercises aimed at improving an individual's physical capabilities and overall well-being. The biopsychosocial (BPS) model provides substantial evidence in favour of the notion that physical activity (PA) and exercise are efficacious coping strategies for individuals facing mental health difficulties (Congsheng et al., 2022; Di Benedetto, 2015). The primary objective of physical

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training is to enhance an individual's performance and physical abilities.

Conversely, physical inactivity, which is characterised by a dearth of bodily movement, increases the likelihood of health problems that can detrimentally affect an individual's overall state of well-being (Malm, Jakobsson, & Isaksson, 2019). In contrast, prior research has also demonstrated that exercise motivations play an equally significant role in enhancing mental well-being (Farholm & Sørensen, 2016). Due to the release of endorphins and serotonin, two neurochemicals associated with positive emotions, the consumption of PA is known to elicit an enhanced sense of well-being. Additionally, it is important to note that physical activity has advantageous effects on mental health in addition to improving physical fitness (Sharma, Madaan, & Petty, 2006). Similarly, involvement in sports has been found to have a significant impact on enhancing mental well-being (Congsheng et al., 2022; Pascoe et al., 2020). The association between participation in sports, including both competitive and recreational activities, and improved psychological well-being, enhanced mental wellness, and reduced psychological distress suggests a potential augmentation of mental health (Congsheng et al., 2022).

The prioritisation of addressing mental health concerns among young individuals is of utmost significance in developed countries within the present context (Li et al., 2022). Previous research has predominantly concentrated on countries other than Canada, as indicated by the existing literature (Congsheng et al., 2022; McDaid et al., 2022; Pascoe et al., 2020; Tester-Jones et al., 2020). However, limited attention has been given to Canada in these studies. One prominent theoretical deficiency within the Canadian context pertains to the absence of a comprehensive framework that effectively amalgamates strategies for promoting mental health with those for engaging in physical activity and participating in sports (Nienhuis & Lesser, 2020). Although previous studies indicate the advantages of engaging in these activities, there is a dearth of a cohesive methodology specifically designed to address the distinctive sociocultural and environmental aspects of Canada. In the Canadian context, there exists a notable challenge pertaining to the escalating levels of stress experienced by college students. This issue is predominantly attributed to the academic demands placed upon them (Duffy et al., 2020; Prowse et al., 2021).

The present circumstances require a pragmatic intervention that incorporates sports as an effective mechanism for mitigating stress and promoting improved overall health among students (Henriksen et

al., 2020) The existing body of research, particularly from the United States as exemplified by Judge (2018), sheds light on the favourable influence of sports on the mental well-being of college students. However, a knowledge gap persists regarding the applicability of these findings within the context of the Canadian higher education system. Hence, it is imperative for Canada to implement customised interventions that capitalise on the beneficial impacts of sports in order to alleviate stress levels among its student population and foster mental well-being (Henriksen et al., 2020). In order to effectively address the distinct stressors experienced by Canadian college students, it is imperative to establish collaborative initiatives involving educational institutions, sports organisations, and mental health professionals. These partnerships are essential for the development and implementation of evidence-based programmes. This study aims to explore the associations between physical activity (PA), exercise motives, sports engagement, and mental health among Canadian university students, with the objective of addressing existing gaps in the literature. The research findings regarding the impact of physical activity, exercise motivations, and sports involvement on enhancing mental health in Canadian universities hold great importance due to their potential to contribute significantly to the overall well-being of students. The findings presented in this study highlight the significant correlation between participation in physical activities, possessing meaningful exercise motives, and engaging in active sports with the enhancement of mental health. These results offer a valuable guide for universities and policymakers to prioritise the comprehensive well-being of students. The aforementioned statement emphasises the necessity for universities to allocate resources towards the development of facilities and programmes that facilitate physical activity. By doing so, universities can provide students with a valuable outlet to mitigate stress, improve mood, and enhance their overall mental well-being. This research provides support for the mental well-being of university students and contributes to the development of a healthier and more resilient student population, thereby yielding benefits for both individuals and wider Canadian society. The research has been structured into five distinct chapters, namely: introduction, literature review, research methodology, data analysis and findings, and discussion. Additionally, the final chapter encompasses the limitations of the study and provides suggestions for future research directions.

Literature Review

The field of mental health research holds great importance on a global scale, as scholars and researchers place significant emphasis on enhancing overall health and achieving equitable health outcomes worldwide (Enrico G. Castillo et al., 2020). The concept under consideration is commonly understood as a condition in which individuals are able to actualize their inherent capabilities, effectively manage the various pressures encountered in life, and sustain a level of performance that is conducive to productivity. The concept of mental health encompasses a range of cognitive and affective dimensions, including but not limited to happiness, enjoyment, and pleasure, as well as a sense of purpose, meaning, and fulfilment (Bratman et al., 2019). However, the escalating prevalence of mental illness, encompassing cognitive, emotional, and behavioural disturbances, poses a significant concern within the realm of mental health. Consequently, there is a growing significance placed on research pertaining to mental disorders that have the potential to detrimentally impact an individual's mental welfare (Díaz-Caneja et al., 2021).

Furthermore, amidst the COVID-19 pandemic, there has been a substantial escalation in the imperative to mitigate mental health concerns on a global scale. The World Health Organisation (WHO) has expressed significant concern regarding the impact of the pandemic on mental health and psychological well-being (Kumar & Nayar, 2021). There has been an observed increase in the prevalence of mental illness in developing nations. Psychologists and mental health specialists posit that a subsequent deterioration in mental well-being is anticipated, characterised by an increase in instances of depression, self-harm, and suicide (Kumar & Nayar, 2021). According to the research conducted by Kotera, Ting, and Neary (2021), it has been observed that young individuals, particularly those enrolled in higher education institutions, exhibit suboptimal mental well-being, leading to the development of negative perspectives. According to their research calculations, approximately 30% of individuals aged 16 and older are experiencing mental health issues. Additionally, a study by Khodabakhsh et al. (2021) sheds light on the significant negative effects of the COVID-19 pandemic on people's mental health, potentially leading to increased levels of stress and feelings of hopelessness. Furthermore, the implementation of lockdown measures and adherence to safety protocols have resulted in an increase in internet usage among juveniles in Canada. This trend has the potential to exacerbate health concerns and contribute to a decline in physical activity levels (Kumar & Nayar, 2021).

Moreover, physical activity (PA) has been identified as a prominent determinant of health, particularly among the younger population (Júdice et al., 2017). It serves as a protective measure against mental disorders, which are characterised by voluntary movements of the skeletal muscles that require energy expenditure. Research has demonstrated that physical activity (PA) exerts an antidepressant effect on individuals. Exercise, which falls under the category of physical activity (PA), encompasses structured and intentional endeavours aimed at enhancing physical fitness, such as weightlifting or running. Moreover, engaging in physical activity (PA) offers psychological benefits that contribute positively to mental well-being (Kandola et al., 2019). Based on the utilisation of the Bio-Psychosocial (BPS) model (Di Benedetto et al., 2010), a substantial body of empirical research (McDowell, MacDonncha, & Herring, 2017), and comprehensive analyses (Chavda et al., 2023), it is evident that physical activity (PA) plays a significant predictive role in mental health outcomes (Fricke, 2019).

Consequently, the utilisation of physical activity (PA) emerges as a pivotal strategy for augmenting the mental health and overall well-being of individuals. Physical activity encompasses various components, such as structured exercise regimens, active transportation, daily chores, and recreational sports (Rebar & Taylor, 2017). Physical activity (PA) has a substantial impact on mental health conditions such as anxiety and depression, rendering it an essential health behaviour from a public health perspective. Extensive research has been conducted to explore the benefits of physical activity (PA) on mental health amidst the COVID-19 pandemic, as evidenced by a number of scholarly inquiries (Lesser & Nienhuis, 2020; Shahidi, Stewart Williams, & Hassani, 2020). The aforementioned findings underscore the significance of engaging in physical activity during periods of quarantine, as it appears to possess both anxiolytic and antidepressant attributes. This research gap is of considerable importance, as the studies conducted thus far have not specifically addressed the Canadian youth context.

Engaging in physical activities, such as sports, represents an additional efficacious approach to mitigating mental health concerns. Sports refer to structured athletic competitions that require physical exertion and skill and are participated in by individuals or groups with the aim of entertainment and amusement (Calleja-González et al., 2023). In contrast, the study conducted by Malm et al. (2019) has demonstrated that while sports can enhance both physical and mental well-being, they can also exert an adverse influence on mental health due to the potential risks associated with injury, burnout, and disordered eating. Elite athletes, who face

immense pressure to perform at their optimal level, often encounter these adverse consequences, which may potentially have deleterious implications for their mental well-being. Contrary to this viewpoint, the research conducted by Eigenschenk et al. (2019) reveals that engagement in outdoor activities can exert a substantial influence on mental well-being, functioning as a therapeutic intervention for individuals experiencing mental health issues. Engaging in athletic activities has been found to enhance subjective well-being, overall life contentment, and overall quality of life, thereby exerting a positive influence on both physical and psychological well-being.

Conversely, a plethora of studies have undertaken investigations into the correlation between exercise motivations and enhanced mental well-being. Prominent scholarly investigations have focused on self-determination theory, which underscores the significance of autonomous motivation in sustaining exercise adherence over an extended period and its beneficial impact on mental well-being (Cassidy et al., 2019; Schuch & Vancampfort, 2021). Chekroud et al. (2018) provide further elucidation on the psychological advantages of exercise, specifically in the reduction of symptoms related to anxiety and depression. The authors also acknowledge the influence of exercise motives on sustaining these benefits. Firth et al. (2016) conducted a comprehensive investigation into the relationship between exercise motivation and psychological well-being. Their study emphasised the importance of intrinsic motivation in promoting and maintaining mental well-being through exercise. Additionally, Barton and Pretty (2010) conducted a study that revealed exercise to be a significant factor in enhancing mental well-being.

Upon conducting a comprehensive analysis of existing scholarly works, it becomes evident that a notable research void exists within the Canadian context. Specifically, there is a pressing need to investigate the impact of physical activity, exercise motives, and sports engagement on the mental well-being of Canadian adolescents. This inquiry is particularly crucial given the unique challenges and pressures faced by this demographic group. Therefore, study has following research hypothesis and Research framework,

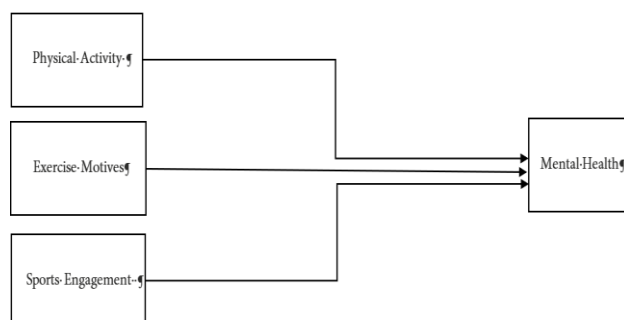


Figure 1: Research Framework

H1: Physical activity has significant effect on mental health.

H2: Exercise motives has significant effect on mental health.

H3: Sports engagement has significant effect on mental health.

Research Design

The purpose of this study was to examine the impact of sports involvement, physical activity, and exercise motivation on the mental well-being of Canadian sports students. In order to achieve this objective, a quantitative research approach was utilised, employing a cross-sectional research design. The study's objective to investigate the relationships between exercise motives, participation in sports, and mental health outcomes at specific time points is supported by the selection of a quantitative approach and a cross-sectional design (Lindell & Whitney, 2001; Williams, 2007). The use of SPSS software for data analysis is justified due to its ability to conduct robust statistical analysis. This software allows researchers to explore patterns, correlations, and associations among the variables being investigated, thereby enhancing the rigour and validity of the study (Verma, 2012).

Survey Instrument

The impact of physical activity (PA), exercise motivations, and participation in sports on mental health was investigated by researchers in a study that utilised a survey methodology. The survey was designed based on previous research findings (Appelqvist-Schmidlechner et al., 2020; Hewitt et al., 2022; Snedden et al., 2019). The evaluation of mental health consists of four components, as outlined by Appelqvist-Schmidlechner et al. (2020). During the evaluation of physical activity (PA), the researchers used a single question to assess participants' self-reported leisure-time PA. This question encompassed the participants' activities within the preceding three-month period. The participants were specifically queried regarding their leisure-time physical activity habits using the question, "Among the provided definitions, which one most accurately describes your leisure-time physical activity habits?" This question was derived from a study conducted by Appelqvist-Schmidlechner et al. (2020). Furthermore, the researchers employed four metrics to assess the degree of self-reported engagement in sports among the participants. These metrics were adapted from a prior study conducted by Snedden et al. (2019).

Finally, the measurement of exercise motives encompassed two distinct dimensions: psychological motives and fitness motives. The dimensions under investigation encompassed the measurement of psychological motives through the

utilisation of four items, while fitness motives were assessed using three items. The aforementioned items were derived from the research conducted by Hewitt et al. (2022). The constructs were assessed using a five-point Likert scale. The construct that was adopted was distributed among university students in Canada. A total of 600 sports students were selected in a convenient manner (Kitagawa, 2021). The convenient sampling method, while not fully capturing the diversity of the sports university student population, was chosen due to its practicality. This approach enables cost-effective and efficient data collection, aligning with the study's resource and timeline limitations (Etikan, Musa, & Alkassim, 2016). Out of the total pool of 600 instruments, a response rate of 500 questionnaires was achieved. Out of the total 500 questionnaires collected, a total of 489 questionnaires were deemed valid and included in the final analysis.

Statistical Techniques

The researchers utilised two statistical techniques for analysis. The initial component pertains to descriptive statistics, while the subsequent component involves inferential statistics, wherein the hypothesis of the study is tested.

Diagnostics Test

In the present study, SPSS version 24 was employed to address the concern of missing data by determining the minimum (1) and maximum (5) values. A small proportion, specifically less than 5%, of the dataset indicated the lack of certain data elements. Consequently, the absence of missing data posed no challenges, and the results of every potential solution were indistinguishable. The assessments of skewness and kurtosis, which indicated the absence of values exceeding 2 and 2, respectively, "indicated the presence of typical univariate normality." There was support for the normality of the univariate distribution from the skewness and kurtosis measures, which showed that no value was greater than 2 and +2. Furthermore, it was determined that the variance inflation factor (VIF) values for all variables under investigation were found to be below the threshold of 5, suggesting the absence of multicollinearity in our study (Becker et al., 2015). Furthermore, the analysis revealed that the common method bias had a value below 50%, suggesting that there is no need for concern regarding common method bias.

Descriptive statistics

Table 1 presents the predicted values, which provide descriptive statistics that offer significant insights into the variables under study. A mean score of 3.40 indicates that, on average, the participants engaged in moderate levels of physical activity. This suggests that the sample consistently engaged in physical activity. The mean score of 3.65

indicated that the exercise motives had a relatively high level of strength. This finding suggests that the participants generally possessed strong motivations for engaging in exercise. Nevertheless, a mean value of 3.25 and a standard deviation of 0.90 show that there is significant variation in sports participation. This higher standard deviation suggests a broader spectrum of responses, ranging from minimal to substantial engagement in sports. The average level of mental health was found to be favourable, as indicated by a mean score of 3.80, suggesting a positive state of well-being. However, the presence of a standard deviation of 0.85 indicates that there is a certain degree of variability in the mental health outcomes observed among the participants. This highlights the significance of taking individual differences into account when evaluating mental health in this particular context. The utilisation of the Likert scale, which encompassed a range of scores from 1 to 5 across all variables, effectively captured a diverse array of responses from participants. The preceding discourse is anticipated in the subsequent Table 1 provided below.

Table 1

Descriptive Results

Construct	Mean	Std. Deviation	Min	Max
Physical Activity	3.40	0.80	1	5
Exercise Motives	3.65	0.70	1	5
Sports Engagement	3.25	0.90	1	5
Mental Health	3.80	0.85	1	5

Sources: Authors own Illustration

Correlation and Multicollinearity

Table 2 displays the correlation matrix, which provides insight into the relationships between variables in the present study that investigates the impact of physical activity (PA), exercise motives, sports engagement, and mental health. Significantly, correlations indicate intriguing patterns. There is a notable and statistically significant positive relationship between physical activity and mental health ($r = 0.456, p < 0.001$), suggesting that increased levels of physical activity are linked to improved mental well-being. There is a significant positive correlation ($r = 0.567, p < 0.001$) between exercise motives and mental health. This implies that people are more likely to experience improved mental health if they have specific motivations, possibly connected to mental health or stress reduction. There exists a weak positive correlation between sports engagement and mental health ($r = 0.123, p < 0.05$). The aforementioned findings suggest that enhancing mental health may necessitate addressing both physical

activity (PA) and exercise motivation. Conversely, although sports engagement remains advantageous, its

association with mental well-being in this particular context is comparatively weaker.

Table 2

Multicollinearity and Correlation matrix

Construct	VIF	Physical Activity (PA)	Exercise Motives	Sports Engagement	Mental Health
Physical Activity	2.12	1	0.123*	0.345**	0.456***
Exercise Motives	1.230	0.123*	1	0.567**	0.346**
Sports Engagement	1.782	0.456***	0.345***	1	0.123*
Mental Health	0.346**	0.567***	0.123*	1

Source: Author's Calculation

Pretesting and Construct Reliability

After conducting the preliminary screening tests, we prioritised the establishment of both face and content validity for our research instrument. In order to accomplish this objective, we undertook a rigorous procedure that encompassed a preliminary study phase involving esteemed professors in the field. Furthermore, we endeavoured to obtain validation from experts in the industry. By incorporating the feedback and insights provided by participants, we have made essential revisions to the questionnaire items, thereby improving the suitability of the instrument. In order to enhance the content validity of our questionnaire, we undertook a comprehensive examination of empirical and theoretical studies that are pertinent to our research constructs. The comprehensive examination facilitated the verification of the questionnaire's efficacy in capturing the fundamental aspects of these constructs. Construct validity was also assessed using an "Exploratory Factor Analysis (EFA)" with varimax rotation (Stapleton, 1997). The main aim of this study was to confirm that all items related to a particular construct were consistently associated with a single factor, with factor loadings greater than 0.50 and eigenvalues exceeding 1 (Stapleton, 1997). The questionnaire was purged of items that did not meet the specified criteria.

To validate the suitability of the factor analysis, we conducted the "Kaiser-Meyer-Olkin (KMO)" test, which "assesses sampling adequacy, and Bartlett's test of sphericity to evaluate homogeneity of variances for the measurement scales" (Shrestha, 2021). The KMO test results revealed that all scales exhibited statistics greater than 0.50, and Bartlett's test indicated significant statistics for all scales ($p < 0.05$). The results of our factor analysis confirmed the validity of our approach (Shrestha, 2021). In addition, the inclusion of a reliability test was an essential component of our validation procedure, and we utilised Cronbach's α -

coefficient as the measure for this particular objective (Peterson & Kim, 2013). It is worth noting that all individual constructs demonstrated a reliability coefficient of $\alpha \geq 0.70$, indicating a high level of reliability and internal consistency (Peterson & Kim, 2013). The reliability assessments were also expanded to encompass the overall constructs, resulting in similarly strong findings with alpha values greater than or equal to 0.70 for all three overarching constructs. The condensed findings are displayed in Table 2, provided below.

Table.2

Construct Reliability and Validity

Variable	Items Loadings	Alpha
Mental Health		0.895
MEH1	0.78	
MEH2	0.81	
MEH3	0.73	
MEH4	0.76	
Physical Activity		0.812
PYA1	0.86	
PYA2	0.92	
PYA3	0.88	
PYA4	0.85	0.871
Sports engagement		
SPE1	0.79	
SPE2	0.82	
SPE3	0.75	
SPE4	0.87	
Exercise motives		
Psychological motives		0.821
PYM1	0.88	
PYM2	0.83	
PYM3	0.90	
PYM4	0.84	
Fitness motives		0.812
FIM1	0.91	
FIM2	0.89	
FIM3	0.92	

Sources: Author's Calculation

Regressions Results

Following an evaluation of the test's reliability, we proceeded to undertake a range of assessments in order to ascertain the appropriateness of our data for regression analysis and to mitigate any potential factors that could impact our findings. Initially, an assessment was conducted to determine the normality of the data through the utilisation of skewness and kurtosis tests, as outlined by Kim (2013). The dataset exhibited a range of skewness values from -0.541 to -1.597, and a range of kurtosis values from 0.111 to 1.434. It is generally accepted that skewness and kurtosis values falling within the range of ± 2 from zero are suggestive of a normal distribution (Horswell & Looney, 1992; Kim, 2013). In the present study, the observed values were found to fall within the acceptable range, suggesting that the normality of the data was not a factor of concern in our research.

An additional crucial factor to be taken into account in regression analysis is the potential existence of multicollinearity, which has the capacity to distort outcomes when there is a high correlation among independent variables. In order to evaluate this, we also computed the variance inflation factor (VIF) for the independent variables, as displayed in Table 2. According to prior research conducted by Alin (2010) threshold value of 3.33 has been proposed as a reliable indicator of the presence of multicollinearity. In the course of our analysis, we observed that the variance inflation factors (VIF) for the variables under consideration were 2.12, 1.230, and 1.782, respectively. These values were found to be significantly lower than the established threshold, thus suggesting that the presence of multicollinearity was not a matter of concern within the

context of our study. In order to examine our research hypotheses, we employed a multiple regression approach. In this study, our objective was to assess the influence of independent variables on the dependent variable.

The relatively high R-squared value of 45% from the multiple regression analysis suggests that physical activity, exercise motivation, and sports participation can account for a significant portion of the variability in mental health. This implies that the collective influence of these three variables accounts for approximately 45% of the observed variability in mental health scores within the sample. The results indicate a significant positive correlation between physical activity and mental health ($\beta = 0.30, p < 0.001$). This suggests that an increase in physical activity is associated with a corresponding increase of 0.30 units in mental health. The results of the study demonstrate a noteworthy positive effect ($\beta = 0.25, p < 0.001$) of exercise motivations on mental health. This suggests that individuals who exhibit higher levels of motivation towards engaging in physical activity tend to report improved mental well-being.

Furthermore, it has been found that active participation in sports has a positive effect on mental well-being, as indicated by a statistically significant beta coefficient of 0.20 ($p < 0.001$). The findings collectively suggest that involvement in physical activity, intrinsic motivation for exercise, and engagement in sports are all correlated with enhanced mental well-being. The acknowledgment of these hypotheses highlights the importance of these factors in facilitating mental health and emphasises their potential relevance in mental health interventions and well-being programmes. The predicted outcomes are presented in Table 4 below.

Table 4

Regression Results

Hypothesis	Unstandardized Beta	t-value	Significance Level	Decision
Physical activity->mental health	0.303	6.00	<0.001***	Accepted
Exercise motives->mental health	0.253	5.80	<0.001***	Accepted
Sports engagement->mental health	0.204	6.50	<0.001***	Accepted
R square	0.45			

Sources: Author's Calculation

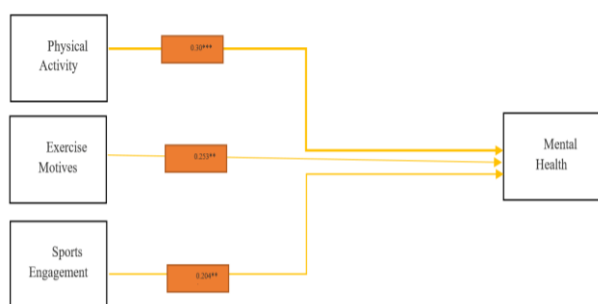


Figure 2: Regression Model

Discussion and Implications

This study aims to make a scholarly contribution by validating a conceptual model that investigates the influence of physical activity (PA), exercise motives, and sports engagement on the mental health of Canadian students. The empirical evidence demonstrates a significant correlation between engagement in physical activity and the psychological well-being of student populations. This finding is consistent with prior studies

that have shown comparable results in relation to the association between physical activity (PA) and mental well-being [Kayani et al. \(2021b\)](#). The findings of this research are consistent with prior studies conducted by [Di Benedetto \(2015\)](#) and [Di Benedetto et al. \(2010\)](#). Hence, the findings of this study demonstrate that physical activity exhibits an antidepressant effect, suggesting its potential as a preventive measure for the preservation of mental well-being ([Kandola et al., 2019](#)). According to [Kandola et al. \(2019\)](#), there is evidence to suggest that engaging in physical activity (PA) can have a beneficial impact on mental health, thereby significantly contributing to overall well-being.

Additionally, a study by [Clough et al. \(2016\)](#) showed that just 15 minutes of physical activity each day can decrease the likelihood of experiencing depressive and anxiety symptoms by 26%. The establishment of a consistent exercise routine has been found to decrease the likelihood of relapse in individuals with mental health disorders. Physical activity (PA) has been found to induce several advantageous alterations in the brain, leading to an efficacious approach for the treatment of mental disorders. Endorphins, which are hormones, are released during physical exercise, contributing to a sense of well-being. Additionally, they endeavour to mitigate negative emotions associated with stress and depression. Essentially, the implementation of physical activity (PA) plays a significant role in enhancing the mental well-being of students. Therefore, the preceding discourse has demonstrated that physical activity plays a significant role in enhancing the mental well-being of students in Canada. Moreover, our study demonstrates that active participation in sports is positively associated with mental well-being. The findings presented in this study align with previous research conducted by [Kayani et al. \(2021a\)](#), as well as [Kayani et al. \(2020\)](#). These earlier studies have demonstrated that heightened involvement in sports and physical activity is associated with enhanced psychological well-being. Sports, in their capacity as structured athletic competitions, provide a significant platform for promoting mental well-being and physical fitness. According to [Jukic et al. \(2020\)](#), sports can be defined as skill-based and physically demanding activities that involve competitive engagement among individuals or teams, primarily pursued for recreational purposes. In addition, [Eigenschenk et al. \(2019\)](#) have emphasised the therapeutic advantages associated with engaging in outdoor sports as a means of addressing mental health concerns. Engagement in athletic activities contributes to the improvement of general well-being, life contentment, emotional well-being, and cognitive aptitude.

Moreover, [Siefken, Junge, and Laemmle \(2019\)](#) conducted a study examining the impact of sports on the correlation between mental well-being, leisure-time physical activity, and anxiety and depressive disorders, thereby contributing additional empirical support to the advantageous influence of sports on mental health.

Further research has provided additional evidence that strengthens the statistically significant and positive correlation between mental health and exercise motivation. The current research findings align with a substantial body of existing research within the fields of exercise psychology and mental health ([Farholm & Sørensen, 2016](#)). Numerous empirical investigations have consistently revealed that individuals who possess robust exercise motivations, such as the pursuit of stress alleviation, heightened emotional well-being, or enhanced self-perception, tend to exhibit more favourable mental health outcomes. For example, [Ekkekakis \(2023\)](#) conducted a study that provided evidence for a correlation between reduced levels of sadness and anxiety and exercise motivations driven by the inherent pleasure derived from engaging in physical activity. The aforementioned findings emphasise the significant influence of exercise motivations on mental health outcomes, underscoring the imperative of considering motivational factors in the design of exercise interventions and mental health treatments.

The previously mentioned findings were advantageous from both a theoretical and practical standpoint. The practical implications of the positive associations between physical activity, exercise motivation, sports participation, and mental health are noteworthy for the well-being of university athletes in Canada. Universities ought to consider incorporating strategies aimed at promoting engagement in sports and physical activity into their campus life and wellness initiatives. This may involve offering a variety of sporting and recreational options, along with incentives, to encourage consistent engagement in physical activity. Furthermore, it is imperative for university administrators to promote initiatives that facilitate the cultivation of robust exercise motivations among students, such as stress alleviation or enhanced emotional well-being. This may entail advocating for mindfulness-based exercise programmes, counselling services, or mental health workshops that prioritise the psychological advantages of engaging in physical activity.

Establishing a collegiate atmosphere that places a high emphasis on the psychological well-being of student-athletes has the potential to positively impact their academic performance and overall physical and mental

well-being. Furthermore, the study findings emphasise the interconnectivity of physical and mental health among college athletes, as evidenced by the outcomes of the theoretical framework. To further enhance our theoretical comprehension of the correlation, forthcoming investigations in this domain ought to undertake a more comprehensive exploration of the fundamental mechanisms that connect physical activity, motivation for exercise, and engagement in sports with mental well-being. The provided information has the potential to guide the development of targeted and effective interventions aimed at enhancing mental health and well-being among Canadian university athletes. This, in turn, can contribute to the holistic growth and development of students within this specific community.

Limitations and Future Research Directions

The present study provides significant practical and theoretical contributions. However, it is crucial to acknowledge certain limitations that must be considered in future investigations. At the outset, the research's dependence on empirical evidence to assess the model may give rise to concerns pertaining to common method bias. Hence, it is advisable that forthcoming studies integrate a qualitative methodology and employ comprehensive interviews to supplement the quantitative results. This would enhance the comprehension of the relationships investigated in our study. One additional constraint to take into account pertains to the geographical scope of our study, which was carried out in Canada and gathered data exclusively from a specific region within the nation. The use of this methodology may potentially introduce a form of bias known as sampling bias, thereby imposing limitations on the extent to which our findings can be generalised to other geographical areas within Canada.

In order to improve the applicability of the results, it is recommended that forthcoming studies incorporate data collection from diverse urban and provincial locations throughout Canada. In addition, the study employed self-report measures, which may occasionally lead to an overestimation of associations between variables. In the future, it is conceivable that experimental research designs could be employed to establish causation and enhance the reliability of findings. Also, a significant proportion of the individuals included in our research were a heterogeneous cohort of undergraduate and graduate students from various academic disciplines. By expanding the sample to include a greater range of diversity, the potential for uncovering a multitude of findings and enhancing the study's external validity is heightened.

Conclusion and Recommendations

The findings of this regression analysis conducted on a sample of Canadian university students offer significant contributions to the understanding of the associations between physical activity, exercise motives, sports engagement, and mental health. The evidence suggests that engagement in physical activity has a notable positive impact on the mental well-being of individuals within this particular demographic. The presence of a Beta coefficient of 0.30, along with a p-value indicating high significance, provides clear evidence that increased physical activity (PA) has a positive influence on mental health. Furthermore, the Beta coefficients of 0.25 and 0.20, accompanied by statistically significant p-values, provide evidence of robust associations between exercise motivations, participation in sports, and mental health. The findings collectively underscore the importance of establishing robust exercise objectives, advocating for and facilitating physical activity, and fostering sports engagement among university students in Canada as strategies to enhance their mental well-being.

Based on these findings, it is recommended that Canadian institutions implement a diversified approach in order to address the mental health and well-being of their students. This initiative should encompass endeavours aimed at fostering consistent physical activity within the campus community, such as establishing fully equipped fitness facilities, organising sporting and recreational events, and offering tailored fitness programmes to cater to the preferences of the student body. It is recommended that universities allocate funds towards initiatives aimed at helping students identify and establish connections with their fitness motivations. These initiatives should emphasise the psychological benefits of engaging in physical activity, such as stress reduction and mood enhancement.

To facilitate the holistic well-being of students, it is imperative to ensure convenient accessibility to counselling services and mental health resources. Lastly, the promotion of sports involvement through intramural sports leagues, clubs, and team sports has the potential to foster a sense of inclusion and camaraderie among children, thereby positively impacting their psychological well-being. By implementing the aforementioned recommendations, Canadian colleges have the potential to cultivate a campus culture that places a high value on the mental well-being and holistic development of their students while simultaneously fostering a climate that promotes academic excellence.

References

- Abrantes, L. C. S., de Souza de Morais, N., Gonçalves, V. S. S., Ribeiro, S. A. V., de Oliveira Sedyama, C. M. N., do Carmo Castro Franceschini, S., dos Santos Amorim, P. R., & Priore, S. E. (2022). Physical activity and quality of life among college students without comorbidities for cardiometabolic diseases: systematic review and meta-analysis. *Quality of Life Research*, 31(7), 1933-1962. <https://doi.org/10.1007/s11136-021-03035-5>
- Alin, A. (2010). Multicollinearity. *WIREs Computational Statistics*, 2(3), 370-374. <https://doi.org/10.1002/wics.84>
- Appelqvist-Schmidlechner, K., Vaara, J. P., Vasankari, T., Häkkinen, A., Mäntysaari, M., & Kyröläinen, H. (2020). Relationship between different domains of physical activity and positive mental health among young adult men. *BMC Public Health*, 20(1), 1116. <https://doi.org/10.1186/s12889-020-09175-6>
- Barton, J., & Pretty, J. (2010). What is the Best Dose of Nature and Green Exercise for Improving Mental Health? A Multi-Study Analysis. *Environmental Science & Technology*, 44(10), 3947-3955. <https://doi.org/10.1021/es903183r>
- Becker, J.-M., Ringle, C. M., Sarstedt, M., & Völckner, F. (2015). How collinearity affects mixture regression results. *Marketing Letters*, 26(4), 643-659. <https://doi.org/10.1007/s11002-014-9299-9>
- Bratman, G. N., Anderson, C. B., Berman, M. G., Cochran, B., de Vries, S., Flanders, J., Folke, C., Frumkin, H., Gross, J. J., Hartig, T., Kahn, P. H., Kuo, M., Lawler, J. J., Levin, P. S., Lindahl, T., Meyer-Lindenberg, A., Mitchell, R., Ouyang, Z., Roe, J., Scarlett, L., Smith, J. R., van den Bosch, M., Wheeler, B. W., White, M. P., Zheng, H., & Daily, G. C. (2019). Nature and mental health: An ecosystem service perspective. *Science Advances*, 5(7), eaax0903. <https://doi.org/10.1126/sciadv.aax0903>
- Calleja-González, J., Mallo, J., Cos, F., Sampaio, J., Jones, M. T., Marqués-Jiménez, D., Mielgo-Ayuso, J., Freitas, T. T., Alcaraz, P. E., Vilamitjana, J., Ibañez, S. J., Cuzzolin, F., Terrados, N., Bird, S. P., Zubillaga, A., Huyghe, T., Jukic, I., Lorenzo, A., Loturco, I., Delextrat, A., Schelling, X., Gómez-Ruano, M., López-Javal, I., Vazquez, J., Conte, D., Velarde-Sotres, Á., Bores, A., Ferioli, D., García, F., Peirau, X., Martin-Acero, R., & Lago-Peñas, C. (2023). A commentary of factors related to player availability and its influence on performance in elite team sports. *Frontiers in Sports and Active Living*, 4. <https://doi.org/10.3389/fspor.2022.1077934>
- Cassidy, M., Thompson, R., El-Nagib, R., Hickling, L. M., & Priebe, S. (2019). Motivations and experiences of volunteers and patients in mental health befriending: a thematic analysis. *BMC Psychiatry*, 19(1), 116. <https://doi.org/10.1186/s12888-019-2102-y>
- Chavda, V. P., Vuppu, S., Mishra, T., Stojanovska, L., & Apostolopoulos, V. (2023). Importance of mental health and exercise in the tough time of viral outbreaks. *Maturitas*, 176, 107751. <https://doi.org/10.1016/j.maturitas.2023.03.004>
- Chekroud, S. R., Gueorguieva, R., Zheutlin, A. B., Paulus, M., Krumholz, H. M., Krystal, J. H., & Chekroud, A. M. (2018). Association between physical exercise and mental health in 12 million individuals in the USA between 2011 and 2015: a cross-sectional study. *The Lancet Psychiatry*, 5(9), 739-746. [https://doi.org/10.1016/S2215-0366\(18\)30227-X](https://doi.org/10.1016/S2215-0366(18)30227-X)
- Chow, S. K. Y., & Choi, E. K. Y. (2019). Assessing the Mental Health, Physical Activity Levels, and Resilience of Today's Junior College Students in Self-Financing Institutions. *International Journal of Environmental Research and Public Health*, 16(17), 3210. <https://doi.org/10.3390/ijerph16173210>
- Clough, P., Houge Mackenzie, S., Mallabon, L., & Brymer, E. (2016). Adventurous Physical Activity Environments: A Mainstream Intervention for Mental Health. *Sports Medicine*, 46(7), 963-968. <https://doi.org/10.1007/s40279-016-0503-3>
- Congsheng, L., Kayani, S., & Khalid, A. (2022). An empirical study of physical activity and sports affecting mental health of university students. *Frontiers in Psychology*, 13, 917503. <https://doi.org/10.3389/fpsyg.2022.917503>
- Di Benedetto, M. (2015). *A Biopsychosocial Model of Health Status: An Integrated Approach to Physical and Mental Health* (PhD Thesis, RMIT University: Melbourne, Australia). <https://doi.org/10.13140/RG.2.1.2441.6802>
- Di Benedetto, M., Len Burns, G., Lindner, H., & Kent, S. (2010). A biopsychosocial model for depressive symptoms following acute coronary syndromes. *Psychology & Health*, 25(9), 1061-1075. <https://doi.org/10.1080/08870440903019535>
- Díaz-Caneja, C. M., Martín-Babarro, J., Abregú-Crespo, R., Huete-Diego, M. Á., Giménez-Dasí, M., Serrano-Marugán, I., & Arango, C. (2021). Efficacy of a Web-Enabled, School-Based, Preventative Intervention to Reduce Bullying and Improve Mental Health in Children and Adolescents: Study Protocol for a Cluster Randomized Controlled Trial. *Frontiers in Pediatrics*, 9, 628984. <https://doi.org/10.3389/fped.2021.628984>

- Duffy, A., Keown-Stoneman, C., Goodday, S., Horrocks, J., Lowe, M., King, N., Pickett, W., McNevin, S. H., Cunningham, S., Rivera, D., Bisdounis, L., Bowie, C. R., Harkness, K., & Saunders, K. E. A. (2020). Predictors of mental health and academic outcomes in first-year university students: Identifying prevention and early-intervention targets. *BJPsych Open*, 6(3), e46. <https://doi.org/10.1192/bjo.2020.24>
- Eigenschenk, B., Thomann, A., McClure, M., Davies, L., Gregory, M., Dettweiler, U., & Inglés, E. (2019). Benefits of Outdoor Sports for Society. A Systematic Literature Review and Reflections on Evidence. *International Journal of Environmental Research and Public Health*, 16(6), 937. <https://doi.org/10.3390/ijerph16060937>
- Ekkekakis, P. (2023). *Routledge Handbook of Physical Activity and Mental Health*. Routledge. <https://doi.org/10.4324/9780203132678>
- Enrico G. Castillo, Roya Ijadi-Maghsoodi, Sonya Shadravan, Elizabeth Moore, Michael O. Mensah III, Mary Docherty, Maria Gabriela Aguilera Nunez, Nicolás Barcelo, Nichole Goodsmith, Laura E. Halpin, Isabella Morton, Joseph Mango, Alanna E. Montero, Sara Rahmanian Koushkaki, Elizabeth Bromley, Bowen Chung, Felica Jones, Sonya Gabrielian, Lillian Gelberg, Jared M. Greenberg, Ippolytos Kalofonos, Sheryl H. Kataoka, Jeanne Miranda, Harold A. Pincus, Bonnie T. Zima, & Kenneth B. Wells. (2020). Community Interventions to Promote Mental Health and Social Equity. *FOCUS*, 18(1), 60-70. <https://doi.org/10.1176/appi.focus.18102>
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. <http://dx.doi.org/10.11648/j.ajtas.20160501.11>
- Farholm, A., & Sørensen, M. (2016). Motivation for physical activity and exercise in severe mental illness: A systematic review of intervention studies. *International Journal of Mental Health Nursing*, 25(3), 194-205. <https://doi.org/10.1111/inm.12214>
- Firth, J., Rosenbaum, S., Stubbs, B., Gorchynski, P., Yung, A. R., & Vancampfort, D. (2016). Motivating factors and barriers towards exercise in severe mental illness: a systematic review and meta-analysis. *Psychological Medicine*, 46(14), 2869-2881. <https://doi.org/10.1017/S0033291716001732>
- Fricke, R. (2019). *Cynoglossus westraliensis*, a new species of tonguesole from Western Australia (Teleostei: Cynoglossidae). *Journal of Fish Biology*, 4, 31-40. <https://fishtaxa.com/article-view/?id=47>
- Henriksen, K., Schinke, R., Moesch, K., McCann, S., Parham, William D., Larsen, C. H., & Terry, P. (2020). Consensus statement on improving the mental health of high performance athletes. *International Journal of Sport and Exercise Psychology*, 18(5), 553-560. <https://doi.org/10.1080/1612197X.2019.1570473>
- Hewitt, B., Deranek, K., McLeod, A., & Gudi, A. (2022). Exercise motives impact on physical activities measured using wearable devices. *Health Promotion International*, 37(3), daac071. <https://doi.org/10.1093/heapro/daac071>
- Horswell, R. L., & Looney, S. W. (1992). A comparison of tests for multivariate normality that are based on measures of multivariate skewness and kurtosis. *Journal of Statistical Computation and Simulation*, 42(1-2), 21-38. <https://doi.org/10.1080/00949659208811407>
- Judge, J. (2018). Stress, happiness and psychological well-being among college students: Role of sports in mental health. *International Journal of Physical Education, Sports and Health*, 5(2), 22-25. <https://www.kheljournal.com/archives/2018/vol5issue2/PartA/5-1-58-177.pdf>
- Júdice, P. B., Silva, A. M., Berria, J., Petroski, E. L., Ekelund, U., & Sardinha, L. B. (2017). Sedentary patterns, physical activity and health-related physical fitness in youth: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 25. <https://doi.org/10.1186/s12966-017-0481-3>
- Jukic, I., Calleja-González, J., Cos, F., Cuzzolin, F., Olmo, J., Terrados, N., Njaradi, N., Sassi, R., Requena, B., Milanovic, L., Krakan, I., Chatzichristos, K., & Alcaraz, P. E. (2020). Strategies and Solutions for Team Sports Athletes in Isolation due to COVID-19. *Sports*, 8(4), 56. <https://doi.org/10.3390/sports8040056>
- 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. <https://doi.org/10.1016/j.neubiorev.2019.09.040>
- Kayani, S., Kiyani, T., Kayani, S., Morris, T., Biasutti, M., & Wang, J. (2021a). Physical Activity and Anxiety of Chinese University Students: Mediation of Self-System. *International Journal of Environmental Research and Public Health*, 18(9), 4468. <https://doi.org/10.3390/ijerph18094468>
- Kayani, S., Wang, J., Biasutti, M., Zagalaz Sánchez, M. L., Kiyani, T., & Kayani, S. (2020). Mechanism Between Physical Activity and Academic Anxiety: Evidence from Pakistan. *Sustainability*, 12(9), 3595. <https://doi.org/10.3390/su12093595>
- Kayani, S., Wang, J., Kayani, S., Kiyani, T., Qiao, Z., Zou, X., & Imran, M. (2021b). Self-System Mediates the Effect of Physical Activity on Students' Anxiety: A study from Canada. *The Asia-Pacific Education Researcher*, 30(5), 443-457. <https://doi.org/10.1007/s40299-020-00530-0>

- Khodabakhsh, S., Ramasamy, S., Teng, T. Y., & Leng, C. S. (2021). Impact of internet addiction on health anxiety in Malaysian youth during COVID-19 pandemic. *Malaysian Journal of Medical Research (MJMR)*, 5(2), 12-18. <https://doi.org/10.31674/mjmr.2021.v05i02.003>
- Kim, H.-Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restor Dent Endod*, 38(1), 52-54. <https://doi.org/10.5395/rde.2013.38.1.52>
- Kitagawa, T. (2021). Morphological characteristics of the Ryukyuan paradise fish *Macropodus opercularis* (Perciformes: Belontiidae). *FishTaxa*, 18, 1-5. <https://fishtaxa.com/article-view/?id=37>
- Kotera, Y., Ting, S.-H., & Neary, S. (2021). Mental health of Malaysian university students: UK comparison, and relationship between negative mental health attitudes, self-compassion, and resilience. *Higher Education*, 81(2), 403-419. <https://doi.org/10.1007/s10734-020-00547-w>
- Kumar, A., & Nayar, K. R. (2021). COVID 19 and its mental health consequences. *Journal of Mental Health*, 30(1), 1-2. <https://doi.org/10.1080/09638237.2020.1757052>
- 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(11), 3899. <https://doi.org/10.3390/ijerph17113899>
- Li, Y., Dong, Z., Feng, D., Zhang, X., Jia, Z., Fan, Q., & Liu, K. (2022). Study on the risk of soil heavy metal pollution in typical developed cities in eastern China. *Scientific Reports*, 12(1), 3855. <https://doi.org/10.1038/s41598-022-07864-3>
- Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, 86(1), 114-121. <https://doi.org/10.1037/0021-9010.86.1.114>
- Malm, C., Jakobsson, J., & Isaksson, A. (2019). Physical Activity and Sports—Real Health Benefits: A Review with Insight into the Public Health of Sweden. *Sports*, 7(5), 127. <https://doi.org/10.3390/sports7050127>
- McDaid, D., Park, A.-L., Davidson, G., John, A., Knifton, L., McDaid, S., Morton, A., Thorpe, L., & Wilson, N. (2022). *The Economic Case for Investing in the Prevention of Mental Health Conditions in the UK*. Mental Health Foundation. <https://www.mentalhealth.org.uk/sites/default/files/2022-06/MHF-Investing-in-Prevention-Report-Summary.pdf>
- McDowell, C. P., MacDonncha, C., & Herring, M. P. (2017). Brief report: Associations of physical activity with anxiety and depression symptoms and status among adolescents. *Journal of Adolescence*, 55(1), 1-4. <https://doi.org/10.1016/j.adolescence.2016.12.004>
- Nienhuis, C. P., & Lesser, I. A. (2020). The Impact of COVID-19 on Women's Physical Activity Behavior and Mental Well-Being. *International Journal of Environmental Research and Public Health*, 17(23), 9036. <https://doi.org/10.3390/ijerph17239036>
- Pascoe, M., Bailey, A. P., Craike, M., Carter, T., Patten, R., Stepto, N., & Parker, A. (2020). Physical activity and exercise in youth mental health promotion: a scoping review. *BMJ Open Sport & Exercise Medicine*, 6(1), e000677. <https://doi.org/10.1136/bmjsem-2019-000677>
- Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology*, 98(1), 194-198. <https://doi.org/10.1037/a0030767>
- Prowse, R., Sherratt, F., Abizaid, A., Gabrys, R. L., Hellems, K. G. C., Patterson, Z. R., & McQuaid, R. J. (2021). Coping With the COVID-19 Pandemic: Examining Gender Differences in Stress and Mental Health Among University Students. *Frontiers in Psychiatry*, 12, 650759. <https://doi.org/10.3389/fpsy.2021.650759>
- Rebar, A. L., & Taylor, A. (2017). Physical activity and mental health; it is more than just a prescription. *Mental Health and Physical Activity*, 13, 77-82. <https://doi.org/10.1016/j.mhpa.2017.10.004>
- Schuch, F. B., & Vancampfort, D. (2021). Physical activity, exercise, and mental disorders: it is time to move on. *Trends in Psychiatry and Psychotherapy*, 43, 177-184. <https://doi.org/10.47626/2237-6089-2021-0237>
- Shahidi, S. H., Stewart Williams, J., & Hassani, F. (2020). Physical activity during COVID-19 quarantine. *Acta Paediatr*, 109(10), 2147-2148. <https://doi.org/10.1111%2Fapa.15420>
- Sharma, A., Madaan, V., & Petty, F. D. (2006). Exercise for mental health. *Primary Care Companion to the Journal Clinical Psychiatry*, 8(2), 106. <https://doi.org/10.4088%2Fpcc.v08n0208a>
- Shrestha, N. (2021). Factor analysis as a tool for survey analysis. *American Journal of Applied Mathematics and Statistics*, 9(1), 4-11. <https://doi.org/10.12691/ajams-9-1-2>
- Siefken, K., Junge, A., & Laemmle, L. (2019). How does sport affect mental health? An investigation into the relationship of leisure-time physical activity with depression and anxiety. *Human Movement*, 20(1), 62-74. <https://doi.org/10.5114/hm.2019.78539>

- Snedden, T. R., Scerpella, J., Kliethermes, S. A., Norman, R. S., Blyholder, L., Sanfilippo, J., McGuine, T. A., & Heiderscheid, B. (2019). Sport and Physical Activity Level Impacts Health-Related Quality of Life Among Collegiate Students. *American Journal of Health Promotion*, 33(5), 675-682. <https://doi.org/10.1177/0890117118817715>
- Stapleton, C. D. (1997). Basic Concepts in Exploratory Factor Analysis (EFA) as a Tool To Evaluate Score Validity: A Right-Brained Approach. In *The Annual Meeting of the Southeast Educational Research Association (Austin, TX, January, 1997)*. <https://files.eric.ed.gov/fulltext/ED407419.pdf>
- Tamminen, N., Reinikainen, J., Appelqvist-Schmidlechner, K., Borodulin, K., Mäki-Opas, T., & Solin, P. (2020). Associations of physical activity with positive mental health: A population-based study. *Mental Health and Physical Activity*, 18, 100319. <https://doi.org/10.1016/j.mhpa.2020.100319>
- Tester-Jones, M., White, M. P., Elliott, L. R., Weinstein, N., Grellier, J., Economou, T., Bratman, G. N., Cleary, A., Gascon, M., Korpela, K. M., Nieuwenhuijsen, M., O'Connor, A., Ojala, A., van den Bosch, M., & Fleming, L. E. (2020). Results from an 18 country cross-sectional study examining experiences of nature for people with common mental health disorders. *Scientific Reports*, 10(1), 19408. <https://doi.org/10.1038/s41598-020-75825-9>
- Tiaotrakul, A., Koeipakvaen, T., & Sertbudra, P. (2019). The development of physical activity leaders using a contemplative education approach to promote wellness among the elderly. *PSAKU International Journal of Interdisciplinary Research*, 8(2), 180-190. <https://dx.doi.org/10.2139/ssrn.3547090>
- Verma, J. P. (2012). *Data Analysis in Management with SPSS Software*. Springer New Delhi. <https://doi.org/10.1007/978-81-322-0786-3>
- Williams, C. (2007). Research Methods. *Journal of Business & Economics Research (JBER)*, 5(3), 65-72. <https://doi.org/10.19030/jber.v5i3.2532>