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Motivation of Children and Youth for Physical Activity During the COVID-19 Pandemic

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Abstract
Only 25% of children and youth aged 10-17 are meeting the national guidelines for physical activity (PA) in Canada. COVID-19 pandemic regulations have additionally reduced the engagement of children and youth with leisure time PA. **Purpose:** The purpose of this study was to investigate motivations for leisure time PA of children and youth during the COVID-19 pandemic utilizing organismic integration theory (OIT). **Methods:** Participants were children and youth aged 11-14 years, living in Canada at the time of questionnaire completion. Motivations and regulations were assessed online using the Behavioural Regulations in Exercise Questionnaire version 3, and PA was assessed using the Godin Leisure Time Exercise Questionnaire. **Results:** Higher levels of PA intensity were correlated with more autonomous forms of regulations and motivation, whereas lower levels of PA intensity were not significantly correlated with more controlled forms of motivation. Greater scores of the relative autonomy index predicted higher levels of PA intensity. Sex moderated the relationship between integrated regulation and PA, explaining 7-8% of the variance. **Conclusions:** Sex was the key predictor of PA outcomes, indicating other variables beyond regulations should be further explored regarding children and youth's motivations for leisure time PA, in the context of the COVID-19 pandemic. **Health & Fitness Journal of Canada 2022;15(4):3-14**.
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Introduction

Physical activity (PA) is a health-promoting behaviour, essential to children and youth's development and well-being (Janssen & LeBlanc, 2010). Regular PA in childhood decreases the likelihood of developing chronic disease later in life, while additionally promoting mental health through minimizing anxiety and feelings of stress, and increasing self-esteem and innovative ideas, among other benefits (Pan et al., 2016). In addition to the health benefits of PA, PA can act as a means of social connection for youth (Guerrin, Bales, Sweet, & Fortier, 2012), contributing to the establishment of building personal and social assets, which may act as predictors of positive psychological

outcomes (Ullrich-French, McDonough, & Smith, 2012). Drawing from this evidence, the behaviour of PA thus spans numerous domains of an individual's well-being, underscoring the importance of PA engagement among children and youth.

In 2018, over 80% of the world's youth population, aged 5 to 17 years old, were insufficiently physically active based on global guidelines (World Health Organization, 2018). Canadian children are no exception to this trend, with 25% of children aged 10-17 meeting national guidelines for PA, and only 21% of children aged 5-11 years engaging in at least 1.5 hours per day of active play and unstructured PAs (ParticipACTION, 2020).

Psychological correlates are an important part of solving the problem of physical inactivity among children and youth because they can inform key targets for effective behavioural intervention (Bauman et al., 2012; Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). While many factors influence PA, motivation is an important underlying factor at the individual level of PA promotion (Sniehotta et al., 2017). In recent years, Self-Determination Theory (SDT) has emerged as a popular framework in the humanistic tradition for explaining and predicting motivation for PA behaviours (Rhodes, McEwan, & Rebar, 2019). The sub-theory of SDT, Organismic Integration Theory (OIT), breaks down motivation for a behaviour into six regulations and motivations, which exist on a continuum of the degree to which the motivation is autonomous, from amotivation to intrinsic motivation (Deci & Ryan, 2002).

It is well supported in the literature that the self-determination of children and adolescents is associated with PA levels (Owen, Smith, Lubans, Ng, & Lonsdale, 2014; Sebire, Jago, Fox, Edwards, & Thompson, 2013). For example, more autonomous motivational regulations in physical education classes are found to have a significant effect on the intention to practice sports outside of school (Cid et al., 2018). However, in specifically investigating the full spectrum of behavioural regulations, there are intermittent findings with their relationships to PA in children and adolescents. With adolescents, intrinsic and extrinsic forms of motivation have been found to positively predict PA behaviour, with amotivation negatively predicting PA behaviour (Chicote-López, Abarca-Sos, Gallardo, & García-González, 2018). A meta-analysis of SDT studies including children and youth aged 10 to 17 years determined that intrinsic motivation and autonomous regulations had moderate positive associations with PA, whereas controlled forms of regulation and amotivation had weak negative associations (Owen et al., 2014). Further research to this extent is needed to clarify these relationships and ultimately define how behavioural regulations and motivations in the context of OIT relate to children and youth PA.

Thus, the purpose of this study was to investigate children and youth's general autonomous motivation and specific behavioural motivation and regulations for leisure time PA, exploring possible interactions with sex and age. Based on prior research and theory, we hypothesized autonomous and more internalized behavioural regulations (identified regulation and integrated regulation), and intrinsic motivation, would significantly correlate with and predict higher levels of PA intensity in children and youth, whereas less internalized and more external forms of

behavioural regulations (external regulation and introjected regulation), and amotivation, would significantly correlate with and predict lower levels of PA intensity in children and youth. It is well understood through the literature that PA behaviours vary by sex and age of children and youth (ParticipACTION, 2020), however, there remains a gap in understanding whether motivations or regulations in accordance with OIT have an important role in these outcomes.

Lastly, it is important to note this study occurred during the COVID-19 outbreak in Canada. In 2020, numerous countries around the world imposed restrictions and 'lockdowns' in order to curb the transmission of the virus, which decreased PA and increased sedentary behaviours in a variety of populations (Stockwell et al., 2021). The Government of Canada restrictions included limiting community and social gatherings, sport and playground use, and physical distancing of 2 meters between individuals not part of an immediate family or bubble (Government of Canada, 2020). As a result, the daily lives of children, youth, and their families in Canada were significantly altered, with noted adverse impacts to movement and play behaviours of children and youth (Moore et al., 2020). This study therefore explored the motivation of children and youth and leisure time physical activity in the context of this COVID-19 landscape.

Methods

Research Design

This study utilized a cross-sectional design, with all data collection occurring through online surveys.

Inclusion and Exclusion Criteria

The inclusion criteria specified that participants must be 11 to 14 years of age. Questionnaires were therefore excluded if participants indicated their age to be outside this boundary.

Recruitment

Participants were recruited through various means. The first recruitment avenue was through one participating middle school from the Greater Victoria School District in Victoria, British Columbia, from April to June 2020. Teachers distributed the online questionnaire to students by email. Due to the interruption from the COVID-19 pandemic, a secondary avenue of recruitment was pursued by sharing the questionnaire through social media channels, such as Facebook, Instagram, and Twitter, from May to August 2020.

Measures

Motivation regulations were assessed using the third version of the Behavioural Regulation in Exercise Questionnaire (BREQ-3) according to SDT framework, a 24-item self-report questionnaire including six subscales: amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation (Markland & Tobin, 2004; Wilson, Rodgers, Loitz, & Scime, 2007; Wilson, Sabiston, Mack, & Blanchard, 2012). Cronbach's alpha for internal consistency was adequate for each; intrinsic motivation (α = .92), integrated regulation (α = .91), identified regulation (α = .73), introjected regulation (α = .83), external regulation (α = .83), amotivation (α = .69). This is consistent with previous findings (Duncan et al., 2010). The Relative Autonomy Index (RAI) is a single score calculated using the sub-scale scores from the BREQ-3 that represents a unidimensional index of the degree of self-determination

(Markland & Tobin, 2004). Each sub-scale is weighted according to its degree of autonomy, multiplied by this weight, then summed together. Amotivation has a weight of -3, external regulation of -2, introjected regulation of -1, identified regulation of +1, integrated regulation of +2, and intrinsic motivation of +3.

PA was assessed using the Leisure Time Exercise Questionnaire (LTEQ); a self-report measure in which participants record the frequency of their light, moderate, or strenuous activity, in at least 15-minute periods, over one week (Godin, 2011). The weighted sum of each exercise intensity was then used to generate a composite PA intensity score, or weekly metabolic equivalent of task (MET). The LTEQ has shown to be a valid, reliable, and cost-effective self-report measure to determine levels of leisure time activity in children and adolescents and has been used repeatedly across age groups (Eisenmann, Milburn, Jacobsen, & Moore, 2002; Godin, 2011).

The sex of participants was determined by a self-report selection of 'Male,' 'Female,' or 'Other'. Age was determined through a self-report text box. Participants' geographic locations were collected through a self-report text box asking 'Location (City, Town, etc.).'

Procedures

Following COVID-19 regulations, all research procedures that included human participants were completed online. The LTEQ, BREQ-3, and demographic questions were combined into one online questionnaire using SurveyMonkey, accessible on a computer or smartphone device. Participants and their parents or guardians were required to electronically sign an informed consent form to be granted access to the questionnaire. All procedures were approved by the University of Victoria Ethics Board, protocol number 19-0487.

Data Analysis

Data was analysed using SPSS for Mac version 26. Descriptive statistics and bivariate correlations were computed using significance score $p < 0.05$. Multivariate linear regression was conducted to determine whether behavioural regulations, motivations, RAI score, age, and sex predicted PA intensity. A sample size calculation for multiple regression using G*Power 3.1 indicated a minimum sample size of 95 was required with 6 predictors, a p-value = .05, and a medium effect size $f^2 = .15$, to achieve power = .80 (Faul, Erdfelder, Buchner, & Lang, 2009). Sex was dummy coded with male as the base case of 0 and female as 1. Due to only one participant identifying their sex as 'Other,' this participant was excluded from data analysis. T-tests were used to infer statistically significant absolute differences between the means of females and males. Fisher's Z-scores were used to assess statistically significant differences in bivariate correlations between females and males, with alpha levels et at 0.05 (Fisher, 1915). Cohen's (1992) effect sizes were used to aid in the interpretations of the findings, which included $r = .10$, $r = .30$, and $r = .50$ for correlations and $d = .20$, $d = .50$, and $d = .80$, for mean differences, respectively.

Moderation of the six motivations was conducted through hierarchical linear regression with the inclusion of interaction terms. Step-wise regression was used to allow all interaction terms to be considered for entry into the regression to improve statistical power due to the sample size. This technique has been supported in the literature as suitable for exploratory data

analysis (Cohen, Cohen, West, & Aiken, 2013; Rhodes, Courneya, & Jones, 2005).

Data Screening

Data (N = 110) was screened prior to analysis for missingness and outliers (>Z = 3.25). Questionnaires, where the age range of participants was outside the inclusion range, were excluded (n = 13). Skewness and kurtosis of the data were assessed and deemed within appropriate variability ranges of skewness – 2 to + 2 and kurtosis - 7 to + 7 (Hair, Black, Babin, & Anderson, 2010). After outliers (n = 2) were removed, the total sample (N = 95) met the regression analysis assumptions for normality, linearity, homogeneity, homoscedasticity and residuals. Composite PA intensity scores had a skewness of 1.12 and kurtosis of 1.15. Amotivation had a skewness of 2.00 and kurtosis of 4.01; extrinsic motivation had a skewness of 1.35 and kurtosis of 1.90; introjected regulation had a skewness of 0.44 and kurtosis of -0.53; identified regulation had a skewness of -0.68 and kurtosis of -0.40; integrated regulation had a skewness of -0.25 and kurtosis of -1.12; intrinsic motivation had a skewness of -0.64 and kurtosis of -0.47.

Results

Descriptive Statistics: Participants

Participants of this study (N = 95) were children and youth aged 11 to 14 years old (M = 12.59, SD = 1.06) living in Canada. Participants identified their sex as male (n = 39), female (n = 55), and other (n = 1).

Table 1: Descriptive Statistics and Comparison of BREQ-3 Scores and PA Intensity Among Male and Female Study Participants (N = 94).

	All (n = 94)		Females (n = 55)		Males (n = 39)					
	M	***SD***	***M***	***SD***	***M***	***SD***	**Cohen's *d***	***t***	***p***	**95% CI**
Age	12.57	1.05	12.71	1.13	12.39	0.91	0.31	-1.54	0.13	[-0.74, 0.09]
Intrinsic motivation	11.10	3.96	10.58	4.09	11.82	3.71	0.32	1.53	0.13	[-0.37, 2.84]
Integrated regulation	9.10	5.09	8.76	4.99	9.56	5.26	0.16	0.74	0.46	[-1.34, 2.95]
Identified regulation	11.41	3.47	11.11	3.67	11.85	3.17	0.22	1.04	0.30	[-0.67, 2.15]
Introjected regulation	5.88	4.18	5.67	4.29	6.18	4.04	0.12	0.58	0.56	[-1.22, 2.23]
External regulation	3.78	3.62	4.33	3.81	3.00	3.24	0.38	-1.82	0.07	[-2.77, 0.12]
Amotivation	1.03	1.89	1.02	1.99	1.05	1.75	0.02	0.09	0.93	[-0.73, 0.80]
Intensity (MET)	79.62	47.05	64.53	31.76	98.55	55.28	0.75	3.63	0.00	[16.31, 56.42]
RAI	46.37	27.17	43.00	29.36	51.13	23.27	0.31	-1.50	0.14	[-18.92, 2.67]

The mean age for females was M = 12.71, SD = 1.13, while the mean age for males was M = 12.39, SD = 0.91. Descriptive statistics and inferential data for all participants can be found in Table 1.

PA Comparisons Between Males and Females

Both males and females, on average, met the LTEQ threshold for 'Active' leisure time activity with composite PA intensity scores over 24 points (males M = 98.55, SD = 55.28, females M = 64.53, SD = 31.76). T-tests displayed that males and females differed significantly in composite PA intensity scores (t(55) = -3.63, p < 0.01), with a moderate effect size (d = 0.75), indicating males were more active than females.

Correlations Among Motivation and PA

In bivariate correlations, Pearson's r coefficients were interpreted as 0.1 < |r|< 0.3 small or weak correlation, 0.3 < |r|< 0.5 medium or moderate correlation, 0.5 < |r| large or strong correlation (Cohen, 1988). For females, the intensity was moderately positively correlated with identified regulation (r = .438, p < 0.01) and intrinsic motivation (r = .392, p < 0.01), and moderately negatively correlated with amotivation. (r = -.314, p < 0.05). For males, moderate positive correlations were found between identified regulation and intensity (r = .375, p < 0.05) and intrinsic motivation and intensity (r = .497, p < 0.01). Integrated regulation was strongly positively correlated with PA intensity (r = .544, p < 0.01). No Z-scores were statistically signficiant at p < 0.05 or outside of the ±1.96 range, indicating that males and females did not differ in bivariate correlations. All bivariate correlations can be found in Table 2.

Multivariate Prediction of PA

Multivariate prediction of PA can be found in Table 3. In a model of all regulations and motivations (Model 1), only sex was found to be a statistically significant predictor of PA intensity (ß = -3.13, p < .01) through this analysis. When considering a simplified model using only the relative autonomy index score (Model 2), both sex (ß = -.326, p < .01) and RAI (ß = .377, p < .01) were predictive of PA intensity as seen in Table 4.

Exploratory Interaction Analyses of Sex and Age

Sex moderated the effect of integrated regulation on PA intensity, as evidenced by a statistically significant increase in total variation explained of 7.8% [F_{change} (84) = 10.969, p < .01; see Table 5]. Males had significant prediction from integrated regulation (ß= 5.80, p <.01), whereas females did not (ß = 1.34, p = .210). Figure 1 demonstrates this interaction. No regulations or motivations were found to be significant predictors of PA intensity at p < 0.05, therefore there was no mediation analysis.

Figure 1: Sex Moderation on Integrated Regulation Predicting PA Intensity.

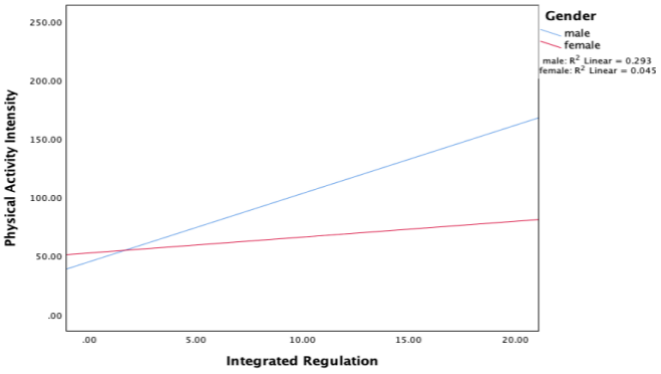

Table 2: Bivariate Correlations Between Behavioural Regulations/Motivation and PA Intensity.

		1	*2*	*3*	*4*	*5*	*6*	*7*
1	**Amotivation**	--	.219	.032	-.084	-.043	.046	.087
2	**External**	.272*	--	.018	-.028	-.080	-.187	-.073
3	**Introjected**	-.298*	.160	--	.450**	.369*	.336*	.151
4	**Identified**	-.450**	-.086	.499**	--	.667**	.534**	.375*
5	**Integrated**	-.491**	-.092	.392**	.720**	--	.616**	.544**
6	**Intrinsic**	-.558**	-.321*	.361**	.761**	.793**	--	.497**
7	**Intensity (METS)**	-.314*	-.183	.231	.438**	.212	.392**	--

Note: Female lower axis, male upper axis.
*Correlation is significant at 0.05 level (2-tailed).
**Correlation is significant at 0.01 level (2-tailed).

Table 3: Regression Predicting PA Intensity From Age, Sex, and Behavioural Regulations/Motivation.

	F	*df*	*R²*	*B*	*SE*	*ß*	*t*	*p*
	5.089	8	.260					
Age				-.273	4.410	-.006	-.062	.951
Sex				-29.743	8.902	-.313	-3.341	.001
Amotivation				1.993	2.457	.080	.811	.420
External				-.633	1.326	-.049	-.477	.634
Introjected				-.082	1.204	-.007	-.068	.946
Identified				1.941	1.957	.143	.992	.324
Integrated				1.092	1.355	.118	.806	.422
Intrinsic				2.720	1.760	.229	1.545	.126

Table 4: Regression Predicting PA Intensity From Age, Sex, and RAI Scores.

	F	*df*	*R²*	*B*	*SE*	*ß*	*t*	*p*
	12.006	3	.286					
Age				-.228	4.031	-.005	-.056	.955
Sex				-30.990	8.660	-.326	-3.578	.001
RAI				.653	0.156	.377	4.188	.000

Table 5: Sex Moderation of Integrated Regulation When Predicting PA Intensity.

	F_{change}	*df*	R^2_{change}	ß 1	ß 2
Block 1	5.089**	85	.324		
Age				.080	.005
Sex				-.049	-.012
Amotivation				-.007	-.024
External				.143	.151
Introjected				.118	.380*
Identified				.229	.390*
Integrated				-.006	.022
Intrinsic				-.313**	.218
Block 2	10.969**	84	0.78		
Integrated x Sex					-.678**

Note: *$p < .05$; **$p < .01$.
ß 1-2 = standardized regression coefficients for equations #1, #2.

Discussion

Regular PA in childhood and adolescence has numerous positive benefits to physical, mental, and psychosocial health. Yet Canadian children are not engaging in enough leisure time PA to realize the full range of these benefits (ParticipACTION, 2020). The COVID-19 pandemic has significantly altered children and youth's social and built environments, as well as their day-to-day reality, and created barriers to children's PA participation. Therefore, the purpose of this study was to explore the behavioural regulations of children and youth for leisure time PA during the COVID-19 pandemic, allowing us to gain insight for future research and intervention, and ultimately promote leisure time PA behaviours among children and youth. This research additionally lends itself as a frame of reference for PA behaviours and motivations during the COVID-19 pandemic, which may be beneficial as a touchpoint for future research of the same nature following the loosening of pandemic restrictions.

Our findings indicated no specific regulations or motivations predicted PA behaviour outcomes; rather, the single index RAI score was a significant independent predictor of PA intensity along with prediction by self-reported sex. These results support the general tenets of SDT that autonomous motivation predicts greater PA behaviour at a basic level, as well as the continuum approach to motivations. There was multicollinearity between BREQ-3 constructs in our study, resulting in overlapping variances, although this may be due to statistical power that could only detect medium effect sizes.

Literature supporting single-index autonomous motivation scores, such as the RAI, cites the 'quasi-simplex' pattern of constructs from amotivation to intrinsic motivation (Wilson et al., 2012); however, the multicollinearity observed in our sample is a potential flaw in the aggregated item model with children and youth.

Previous research has debated whether child and youth populations can entirely differentiate between BREQ subscales, and few studies have included the entire spectrum from amotivation to intrinsic motivation (Owen et al., 2014; Seghers, Vissers, Rutten, Decroos, & Boen, 2014). The interpretation of questions on autonomous and controlled motivation, for example, may differ between boys and girls or according to age, biological maturity, or race/ethnicity (Dishman, McIver, Dowda, Saunders, & Pate, 2015).

This study determined that age did not significantly interact with any motivations or behavioural regulations, nor did it predict any PA outcomes. This was interesting as it did not support the findings in previous research that younger children are primarily more intrinsically motivated than their adolescent peers (Owen et al., 2014; Sebire et al., 2013).

Statistics in Canada indicate clear sex and gender-related disparities between boys and girls regarding PA, with boys engaging in more PA than girls, which may coincide with differing levels of motivation for PA behaviour (ParticipACTION, 2020). In our initial predictor model, only sex was found to significantly predict PA intensity, favouring boys engaging in more PA. Biological and psychological maturity may play a role in the differences between boys and girls, where girls of the same age may be developmentally advanced, therefore attaching greater value to extrinsic factors (Ingledew & Sullivan, 2002). Along these lines, girls of greater biological and psychological maturity may begin the decline seen in general PA behaviours through adolescence earlier than their male counterparts, and age samples between 11 to 14 years old may not represent this difference (Dishman et al., 2015; ParticipACTION, 2020; Seghers et al., 2014).

Furthermore, our study found sex to be a significant moderator in the relationship between integrated regulation and PA intensity. Behaviour is often motivated by integrated regulation when it is part of one's sense of self and personally understood identity (Deci & Ryan, 2000). Boys may see PA as part of who they are or integrate PA as part of their identity, more so than girls, due to environmental and social factors supporting this convention (Drummond, 2020; Martínez-Andrés, Bartolomé-Gutiérrez, Rodríguez-Martín, Pardo-Guijarro, & Martínez-Vizcaíno, 2017; Sánchez-Miguel, Leo, Amado, D., Pulido, & Sánchez-Oliva, 2017). This underscores the potential of targeting different motivations and regulations of boys and girls when designing interventions, while considering factors such as developmental maturity, social, and environmental supports.

Despite the interesting findings, this study had noteworthy limitations. Paramount of these was the undetermined nature of the influence of the COVID-19 pandemic and its effect on response to our survey. Second, our study used a self-report measure for leisure time PA reporting, and our study was limited by a cross-sectional design. Lastly, the use of the BREQ-3 as a measure of the OIT continuum was not effective in representing all the facets of the scale for children and youth.

Conclusions

Children and youth around the world are not engaging in enough leisure time PA, and understanding their motivation and behavioural regulations can offer insight for the development of targeted behaviour change interventions. Our study found sex to be significantly predictive of PA intensity

and should be specifically considered in future research. Higher levels of PA intensity were correlated with more autonomous forms of regulations and motivation, whereas lower levels of PA intensity were not significantly correlated with more controlled forms of motivation. No BREQ-3 variables predicted PA intensity after controlling for age and sex; However, greater scores of the relative autonomy index (RAI), predicted higher levels of PA intensity. The study supported the general tenets of self-determination theory. Nonetheless, other variables should be investigated regarding children and youth's motivation for leisure time PA, in the context of the COVID-19 pandemic.

Authors' Qualifications

The authors' qualifications are as follows: Elizabeth Comeau BSc, MSc; Ziba Vaghri BN, PhD; Ryan E. Rhodes BA, MA, PhD.

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