



A cross-sectional examination of the association between co-ed and gender-specific school intramural programs and intramural participation among a sample of Canadian secondary school students

Gillian C. Williams^{a,b,*}, Kathleen E. Burns^a, Kate Battista^a, Margaret de Groh^b, Ying Jiang^b, Scott T. Leatherdale^a

^a School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada

^b Applied Research Division, Public Health Agency of Canada, Ottawa, ON, Canada

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ABSTRACT

Intramurals are an important part of the physical activity offerings in secondary schools; however, it is not well understood how co-ed and gender-specific intramural programs impact intramural participation among male and female students. Therefore, the objective of this research was to examine if the number of co-ed, male-only, and female-only intramurals offered at a school was associated with student participation in intramurals.

A large sample of Canadian secondary school students (N = 59,370) completed the COMPASS survey in 2017–2018. School staff reported the number of co-ed, male-only, and female-only intramurals offered at each school. Students reported whether they participated in school intramurals. Hierarchical models were used to assess associations.

Intramural participation was marginally higher among male students (36%) than female students (32%; $p < 0.0001$). Female students attending schools that offered female-only intramurals were 17% (OR 1.17 [95% CI: 1.05–1.30]) more likely to participate. The number of co-ed and male-only intramurals offered were not significantly associated with student participation.

We found a positive association between offering female-only intramurals and female intramural participation, highlighting the importance of these programs for female students. Offering female-only intramurals may be a way for schools to improve participation and physical activity levels of female students. More research is needed on the impact of specific sports or activities on male and female student participation.

1. Introduction

Physical activity has many important physiological and psychological health benefits for youth. Physical activity promotes muscle and bone health, improved weight status, and cardiovascular development among youth (2018 [Physical Activity Guidelines Advisory Committee, 2018](#); [U.S. Department of Health and Human Services, 2018](#)). Additionally, physical activity in youth reduces the risk of disease later in life including heart disease, cancer, type 2 diabetes, hypertension, osteoporosis and obesity (2018 [Physical Activity Guidelines Advisory Committee, 2018](#); [Janssen and Leblanc, 2010](#)). Psychologically, youth physical activity is associated with improved academic performance ([Álvarez-Bueno et al., 2017](#); [Centers for Disease Control and Prevention, 2010](#)), improved cognition ([U.S. Department of Health and Human](#)

[Services, 2018](#)), reduced symptoms of anxiety and depression (2018 [Physical Activity Guidelines Advisory Committee, 2018](#); [Janssen and Leblanc, 2010](#); [U.S. Department of Health and Human Services, 2018](#)) and aids in social development ([World Health Organization, n.d.](#)). Despite this multitude of health benefits, only about 35% of Canadian youth meet the recommended daily average of 60 min of moderate-vigorous physical activity set out in the Canadian 24-Hour Movement Guidelines, and more male than female youth meet these guidelines ([Colley et al., 2017](#); [Janssen et al., 2017](#); [Roberts et al., 2017a](#)). Strategies to increase physical activity among Canadian youth are warranted, especially among females.

Schools are an important setting for physical activity promotion, as most Canadian youth spend a large proportion of their lives there ([Statistics Canada, 2018; 2017](#); [U.S Department of Health and Human](#)

* Corresponding author at: School of Public Health and Health Systems, University of Waterloo, 200 University Ave W, Waterloo, ON N2L 3G1, Canada.

E-mail address: gillian.williams@uwaterloo.ca (G.C. Williams).

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Services, 2012). School-based physical activity programs are examples of strategies to increase physical activity among youth, and they have the potential to reach a large student population regardless of socioeconomic status and athletic ability (Dwyer et al., 2006). Intramurals are an inclusive opportunity for youth to be physically active within their schools because they are available to students of all skill levels and typically do not require a fee to participate (Action for Healthy Kids, 2015). Intramural programs are played/participated in by students in the same school and may provide students with a wide variety of activities (Fuller et al., 2011; Williams, 2008). Participation in intramurals is positively associated with physical activity (Fuller et al., 2011; Hobin et al., 2013; Kurc and Leatherdale, 2009), as well as lower screen time (Katapally et al., 2018). Sport participation in youth (such as intramural participation), is also associated with physical activity later in life (Cleland et al., 2012; Kjønniksen et al., 2008; Murphy et al., 2017; Richards et al., 2007; Tammelin et al., 2003; Telama et al., 2006). Additionally, because participation in intramurals is inclusive and less-time consuming compared to interscholastic/varsity or community sports, they may allow students to play multiple sports throughout the school year, a concept known as sport sampling (Coté et al., 2009; US Department of Health and Human Services, 2019). Sport sampling may help students find a sport they enjoy playing which encourages confidence and participation that may carry on later in life (Cleland et al., 2012; Coté et al., 2009; Kjønniksen et al., 2008; Murphy et al., 2017; Richards et al., 2007; Tammelin et al., 2003; Telama et al., 2006; US Department of Health and Human Services, 2019). However, many students are missing out on these benefits as <40% of male students and <30% of female students participate in intramurals (Hobin et al., 2012; Kurc and Leatherdale, 2009).

Not only is intramural participation associated with physical activity, but simply offering intramurals in schools is positively associated with student physical activity. For example, students attending schools with large numbers of intramurals tend to have higher levels of physical activity regardless of whether students participate in these intramurals (Fuller et al., 2011). This may be explained by the fact that schools offering large numbers of intramurals encourage a positive physical activity environment which support higher levels of physical activity among students (Fuller et al., 2011). Despite this research, it remains unclear if the number of intramural programs offered is associated with youth participation in these programs. Additionally, it is not well understood how co-ed and gender-specific intramural programs impact intramural participation among Canadian male and female students. Understanding how different types of intramurals are associated with intramural participation would provide secondary schools with practical evidence to aid decision-making relating to the provision of intramural programming. With the generally low physical activity levels among secondary school youth (Colley et al., 2017; Janssen et al., 2017; Roberts et al., 2017), making evidence-informed decisions about intramural programs could increase participation and promote higher levels of physical activity among these youth (Fuller et al., 2011; Hobin et al., 2013; Kurc and Leatherdale, 2009). Therefore, the purpose of this research was to examine (1) if the number of co-ed, male-only and female-only intramurals offered at a school was associated with student participation and (2) if offering gender specific intramurals was associated with participation for females and males respectively.

2. Methods

2.1. Procedure

The COMPASS study is a prospective cohort study that collects data from a convenience sample of students in grades 9 to 12 in British Columbia, Alberta, Ontario, and Quebec, Canada (Leatherdale et al., 2014). Schools are recruited based on their use of an active information passive-consent protocol which is essential in self-report research to produce more robust results that limit self-selection and response bias

(Leatherdale et al., 2014; Thompson-Haile et al., 2013). The student-level data collected are self-reported via a questionnaire administered to students during class time. The COMPASS study also collects school-level information on policies, programs, and the built environment. The hierarchical nature of the data can allow for more robust statistical analyses and evaluations of programs over time. A full description of the COMPASS study methods can be found in print (Leatherdale et al., 2014) or online (www.compass.uwaterloo.ca). All procedures were approved by the University of Waterloo Office of Research Ethics (reference number 30118) and appropriate school board committees.

2.2. Participants

In Year 6 (September 2017-June 2018 school year), 65,892 students participated in the COMPASS study. Student response rate was 81.8% and the primary reason for non-response being absenteeism at the time of data collection. Schools that did not offer co-ed intramurals were excluded from this study ($n = 10$) for a total of 61,882 students. Students with missing values ($n = 2,657$; 4%) were excluded from this study. The Appendix includes information on missing data (Supplemental Table 1) for each variable. The Supplemental Table 2 presents a chi-square comparison of students missing intramural participation data by demographic characteristics. We found significant differences between students with complete versus missing data for measures of gender, grade, and ethnicity. The current analyses used complete data from 59,370 students from 111 schools in Alberta ($n = 6$), British Columbia ($n = 16$), Ontario ($n = 54$), and Quebec ($n = 35$).

2.3. Instrumentation

2.3.1. School-level data (SPP Questionnaire and Statistics Canada Data)

School-level data were collected using the Schools Policies and Programs (SPP) questionnaire, which is completed annually by a school contact. Additional socioeconomic data was collected from the 2016 census.

At the school level, a contact at each school (typically a principal, guidance counsellor, or gym teacher) completed the SPP questionnaire. To assess the number of intramurals offered at each school, school contacts were asked to "Please select the intramural programs/club activities involving physical activity that were offered to students at your school during the past 12 months." Program selection included traditional team sports such as soccer and badminton as well individual activities such as yoga or fitness class. School contacts were additionally asked to indicate whether the offerings were for males/females only or co-ed. There was also space to indicate other activities not listed. Among the included schools, the number of co-ed intramurals offered were categorized based on four quartiles: Q1 (1–3 intramurals), Q2 (4–7 intramurals), Q3 (8–10 intramurals) and Q4 (11–17 intramurals). School contacts also provided school enrollment and the total number of varsity sports offered at the school.

Data on schools' urbanicity was determined by using Geospatial lookup on city name based on 2016 census data (Statistics Canada, 2016a). Urban/rural classifications were based on population and population density and schools were categorized as large urban, medium urban, and small urban/rural. School neighbourhood median family income was determined using school postal code to identify household median income in this area, data from the 2016 census (Statistics Canada, 2016b). School neighbourhood median family income was categorized into 3 groups: less than \$50,000, \$50,001-\$75,000, and greater than \$75,000.

2.3.2. Student level data (Student Questionnaire)

To determine student participation in intramurals students were asked "Do you participate in before-school, noon hour, or after-school physical activities organized by your school? (e.g., intramurals, non-competitive clubs)" with response options "Yes, No, or None offered at my school"

Due to schools with no intramural offerings not being included, students who indicate that none were offered ($n = 2165$, 3.7%) were grouped with students who responded “No.”

Consistent with other youth health research (Elton-Marshall et al., 2011), the following covariates (with their response values in brackets) were included in the analyses: *grade*, (9,10,11,12), *gender* (female, male), *ethnicity* (white, other) *weekly spending money* (Zero, \$1 to \$20, \$21 to \$100, More than \$100, Don't know).

2.4. Data analysis

Descriptive characteristics at the school ($n = 111$) and student ($n = 59,370$) levels were examined by gender. An empty Generalized Linear Mixed Model (GLMM) was used to calculate the Intraclass Correlation (ICC) to determine the variability of student intramural participation between schools. Due to the hierarchical nature of these data (students nested within schools), three hierarchical Generalized Estimating Equation (GEE) models via PROC GENMOD were used to create three models. First, examining the association between co-ed intramural quartiles and total student intramural participation. The second model examined if offering female-only intramural programs was associated with intramural participation among females. Finally, the third model studied the relationship between offering male-only intramurals and participation among males. All models controlled for the covariates listed in the above section. Gender specific models additionally controlled for the total number of co-ed intramurals offered at the school. QIC values were used to assess model fit and indicate that models with all covariates were the best fit (Supplemental Table 3).

3. Results

3.1. Descriptive Statistics

3.1.1. School-level

The characteristics of the school-level sample are presented in Table 1. The mean student enrollment for the schools was 716 students ($SD = \pm 372$). Of the schools that offered co-ed intramurals, 18% of schools offered 1–3 intramural programs, 30% of schools offered 4–7 intramural programs, 25% of schools offered 8–10 intramural programs and 27% of schools offered 11–17 intramurals programs. Of the 111 schools, 42% ($n = 47$) offered female-only intramurals and 27% ($n = 30$) offered male-only intramurals.

Table 1

Descriptive Statistics for School-level Characteristics ($n = 111$) in Year 6 (2017–2018) of the COMPASS study in Canada.

Variable		Freq / mean	% / SD
Income group (\$)	25001–50000	14	12.6
	50001–75000	66	59.5
	>75000	31	27.9
Province	Alberta	6	5.4
	BC	16	14.4
	Ontario	54	48.7
	Quebec	35	31.5
Urbanicity	Large Urban	51	46.0
	Medium Urban	15	13.5
	Small Urban/Rural	45	40.5
Co-ed intramurals	Q1 (1–3 intramurals)	20	18.0
	Q2 (4–7 intramurals)	33	29.7
	Q3 (8–10 intramurals)	28	25.2
	Q4 (11–17 intramurals)	30	27.0
Female only intramurals	No	64	57.7
	Yes	47	42.3
Male only intramurals	No	81	73.0
	Yes	30	27.0
Enrolment (number of students)		715.6	372.2

3.1.2. Student-level

The characteristics of the student-level sample by gender are presented in Table 2. As shown, 50% of the sample was female ($n = 29,943$) and 66% was White ($n = 39,115$). A large majority of students (95%) in the “other” grade category consists of students in secondary 1 and 2 in Quebec which is equivalent to grade 7 and 8. The other 5% could be in 5th year or ESL/FSL classes with no assigned “grade”. Of the total sample, 34% reported participating in intramurals, with more male students (36%) reporting participation in intramurals compared to female students (32%; $p < 0.0001$).

3.2. Regression models

School-level differences accounted for <1% of the student-level variability in intramural participation. Regression results can be found in Table 3. Males (OR = 1.23 [95% CI = 1.16–1.30]) were more likely than females to participate in intramurals. Students in grade 11 (0.83 [0.78–0.88]) and grade 12 (0.75 [0.69–0.81]) were less likely to participate in intramurals, while students in the “other” grade were more likely to participate in intramurals (1.17 [1.02–1.35]), all compared to grade 9 students. These associations were consistent when stratified by gender, as male (0.89 [0.82–0.97]) and female (0.78 [0.71–0.85]) grade 11 and male (0.86 [0.77–0.95]) and female (0.66 [0.59–0.73]) grade 12 students were less likely to participate in intramurals compared to grade 9 students. When stratified by gender, only females in the “other” grade (1.26 [1.07–1.48]) were more likely to participate in intramurals; this association was non-significant among males.

Compared to students with \$0 of weekly spending money, males (\$1–\$20 OR = 1.31 [1.23–1.40]; \$21–\$100 OR = 1.55 [1.44–1.68]; \$100 + OR = 1.37 [1.26–1.48]) and females (\$1–\$20 OR = 1.29 [1.17–1.41]; \$21–\$100 OR = 1.44 [1.32–1.58]; \$100 + OR = 1.28 [1.15–1.43]) with weekly spending money were more likely to participate in intramurals. Regarding ethnicity, female students identifying as “other” had lower odds (0.87 [0.81–0.93]) of intramural participation compared to females identifying as “white”. No relationship between ethnicity and intramural participation was observed for male students.

The number of co-ed intramural programs offered by a school was not significantly associated with intramural participation among students. However, female students attending schools that offered female-only intramurals were significantly more likely (1.19 [1.07–1.32]) to participate in intramurals compared to females attending schools without such intramurals. Lastly, there was no significant relationship between schools that offered male-only intramurals and male intramural participation.

4. Discussion

To our knowledge, this is the first study to explore the association between co-ed and gender-specific school-level intramurals and intramural participation. Although the number of co-ed intramurals offered was not associated with intramural participation among students overall, an important association was observed between female-only intramurals and female participation. Specifically, females attending schools offering female-only intramurals were significantly more likely to participate in intramurals. Participation in intramural activities is positively associated with physical activity among female youth and by providing female-only intramurals, they may be more likely to participate and may be more physically active (Hobin et al., 2012). This is an important finding as female youth are a priority population due to their lower intramural participation (Hobin et al., 2012; Kurc and Leath-erdale, 2009) and lower physical activity levels (Colley et al., 2017; Janssen et al., 2017; Roberts et al., 2017a). A practical application of this finding could be for secondary schools to consider allocating resources to offer female-only intramurals, as these programs could improve intramural participation and physical activity levels among females

Table 2
Descriptive statistics for student level characteristics by gender (N = 59,370) in Year 6 (2017–2018) of the COMPASS study in Canada.

Variable		Total (n = 59,370)		Female (n = 29,943)		Male (n = 29,427)		DF	Chi-square Value	P-value
		Freq	%	Freq	%	Freq	%			
Grade	9	14,166	23.9	7192	24.0	6974	23.7	4	6.8344	0.1449
	10	14,418	24.3	7320	24.5	7098	24.1			
	11	13,769	23.2	6965	23.3	6804	23.1			
	12	8914	15.0	4386	14.7	4528	15.4			
	Other	8103	13.7	4080	13.6	4023	13.7			
Ethnicity	White	39,115	65.9	19,878	66.4	19,237	65.4	1	6.7917	0.0092
	Other	20,255	34.1	10,065	33.6	10,190	34.6			
Weekly Spending Money	Zero	9419	15.9	4200	14.0	5219	17.7	4	377.5938	<0.0001
	\$1-\$20	15,122	25.5	7821	26.1	7301	24.8			
	\$21-\$100	14,118	23.8	7619	25.5	6499	22.1			
	\$100+	10,999	18.5	5011	16.7	5988	20.4			
	Don't Know	9712	16.4	5292	17.7	4420	15.0			
Intramural participation	No	38,999	65.7	20,290	67.8	18,709	63.6	1	115.2954	<0.0001
	Yes	20,371	34.3	9653	32.2	10,718	36.4			

Table 3
Logistic GEE models examining the association between (1) the number of co-ed intramurals and intramural participation among males and females, (2) female only intramurals and intramural participation among females, and (3) male only intramurals and intramural participation among males in Year 6 (2017–2018) of the COMPASS study in Canada.

Variable		(1) Total n = 59,370 OR (95% CI)	(2) Female (n = 29,943) OR (95% CI)	(3) Male (n = 29,427) OR (95% CI)
Grade	9	1.00	1.00	1.00
	10	0.97 (0.91–1.04)	0.93 (0.85–1.02)	1.02 (0.94–1.11)
	11	0.83 (0.78–0.88)	0.78 (0.71–0.85)	0.89 (0.82–0.97)
	12	0.75 (0.69–0.81)	0.66 (0.59–0.73)	0.86 (0.77–0.95)
	Other	1.17 (1.02–1.35)	1.26 (1.07–1.48)	1.10 (0.94–1.28)
Ethnicity	White	1.00	1.00	1.00
	Other	0.97 (0.91–1.03)	0.87 (0.81–0.93)	1.07 (0.99–1.16)
Weekly Spending Money	Zero	1.00	1.00	1.00
	\$1-\$20	1.30 (1.22–1.39)	1.29 (1.17–1.41)	1.31 (1.23–1.40)
	\$21-\$100	1.50 (1.41–1.60)	1.44 (1.32–1.58)	1.55 (1.44–1.68)
	\$100+	1.33 (1.23–1.44)	1.28 (1.15–1.43)	1.37 (1.26–1.48)
	Don't Know	1.26 (1.17–1.35)	1.22 (1.10–1.34)	1.28 (1.17–1.40)
Coed intramural quartiles	Q1	1.00		
	Q2	0.96 (0.84–1.10)		
	Q3	1.01 (0.87–1.18)		
	Q4	1.01 (0.88–1.17)		
Female only intramurals offered	No		1.00	
	Yes		1.19 (1.07–1.32)	
Male only intramurals offered	No			1.00
	Yes			1.08 (0.97–1.19)

Models controlled for province, urbanicity, median school neighbourhood income, varsity sports offered, and school enrolment. Models 2 and 3 also controlled for the total number of co-ed intramurals offered. Values significant at $p < 0.05$ are bolded.

(Fuller et al., 2011; Hobin et al., 2013; Kurc and Leatherdale, 2009).

Although male students participated in more intramural programs compared to females, male-only intramurals were not associated with male intramural participation. This suggests that male students may be

less selective in the intramurals they participate in and may be more open to participating in co-ed programming compared to females. This may be explained by the decreased barriers that male youth may face to sport participation compared to female students. For example, female youth are more likely to experience lower confidence in physical ability and lower perceived knowledge about physical activity and sport compared to males (Johnstone and Millar, 2012). These barriers may be related to gender stereotyping in sport and may be alleviated when participating in female-only sports (Johnstone and Millar, 2012). Additionally, co-ed intramurals may be more appealing to male students compared to female students, as these intramurals may be male-dominated and discouraging to females if they are perceived as intimidating (Bocarro et al., 2014). Male-only intramural programs provide an opportunity for males to participate and be physically active, however if a school is dealing with limited resources, offering female-only intramurals may be an effective strategy to promote physical activity among female students as discussed above. Ecological models of physical activity highlight the multidimensional factors associated with youth physical activity (Sallis et al., 2006) and this study highlights gender-offering of sports as an important school-level effect modifier to be considered in research examining school-level programming and youth physical activity.

Additionally, being in grade 11 and 12 was negatively associated with intramural participation across both males and females. This is consistent with other research to suggest that age is negatively associated with sport participation (Toftegaard-Støckel et al., 2011). These results suggest that after controlling for the number of intramurals offered at a school, older youth are missing out on opportunities to increase their physical activity, which is concerning given that physical activity tends to decrease with age (Contardo Ayala et al., 2018; Harding et al., 2015). Increased participation in these older youth may positively influence physical activity levels. Future research should examine targeting older youth for participation in intramural programs. Perhaps offering more variety in intramural programs at different times throughout the day (e.g., before school, at lunch, and after school) could entice older students by providing them more opportunities to be physically active with their busy academic workloads (Institute of Medicine, 2013; Mahar, 2011). We also found that weekly spending money was significantly and positively associated with intramural participation as students with weekly spending money of \$21-\$100 had the highest odds of intramural participation. Weekly spending money is a proxy measure of socioeconomic status, and previous research has shown socioeconomic status to be positively associated with sport participation (Toftegaard-Støckel et al., 2011).

Females identifying as “other” had lower odds of intramural participation compared to females identifying as “white”. This contrasts with males, where no relationship between ethnicity and intramural

participation were observed. This differential effect of ethnicity on sport participation between male and female youth has also been observed in previous research. For example, Toftegaard-Støckel et al. found a significant interaction effect of gender and ethnicity in relation to sports participation among female students but not males (Toftegaard-Støckel et al., 2011). This interaction was explained by the fact that the females not participating were also older and of lower socioeconomic status in addition to identifying as minorities and could be the case with intramurals as well (Toftegaard-Støckel et al., 2011).

Future research should examine which specific intramural activities impact intramural participation. While this research suggests that female-only intramurals are important for female intramural participation, there may be specific activities that are more appealing to males and females regardless of gender restrictions. For example, individual activities such as swimming and walking tend to be more popular among girls compared to team activities such as baseball and basketball, and this research does not differentiate whether offering co-ed or female-only individual and team activities encourage female participation equally (Michael et al., 2016). Additionally, longitudinal research could examine how intramural programs impact intramural participation and physical activity levels, to make causal inferences.

4.1. Limitations

This study is not without limitations. First, this study has missing data for 4% of students. Previous work examining these students has found no differences in physical activity among missing and non-missing students (Qian et al., 2015), however we found differences in reporting intramural participation by gender, grade, and ethnicity. Although intramural participation is associated with increased levels of physical activity among youth, we did not examine how intramural programs were associated with youth physical activity. It is important to note that, different intramurals will provide youth with different levels of physical activity (Bocarro et al., 2014; Pfeiffer and Wierenga, 2019), for example, soccer, basketball and track were found to provide youth with the highest level of physical activity compared to other sports (Bocarro et al., 2014) and team sports were associated with more physical activity compared to individual activities (Smith et al., 2015). Future research should examine how the offering of different types of intramurals are associated with intramural participation and physical activity among youth. Next, the cross-sectional nature of the data used in this study prevents causal inferences from being made about intramurals and participation. Future work should examine if adding female-only intramurals results in increased student participation over time. Finally, this study makes use of self-reported data and schools were recruited using purposive sampling, potentially limiting the generalizability of results. However, this study had a large sample size of students from four provinces in Canada and used an active-information, passive-consent protocol which encourages participation and honest self-reporting suggesting these conclusions are still relevant to a large number of Canadian high school students (Thompson-Haile et al., 2013).

5. Conclusions

Only one third of Canadian youth are meeting the physical activity guidelines (Roberts et al., 2017a) and numbers are similarly low in the United States (Katzmarzyk et al., 2016) and globally (Tremblay et al., 2016). Schools are a key environment to target youth physical activity due to the large amount of time students spend there and represent a key opportunity in helping youth achieve the recommended physical activity targets. Physical activity promotion and funding in schools is largely based around physical education class (PE) (Hills et al., 2015). This is problematic once students reach high school, as the PE requirements tend to be modest in most Canadian secondary schools (Gouvernement du Quebec, n.d.; Government of Alberta, n.d.; Government of British Columbia, n.d.; Ontario Ministry of Education, 2015) at

the same time when student physical activity levels begin to decrease (Contardo Ayala et al., 2018; Harding et al., 2015).

The current study indicates that offering female-only intramurals may be a way for schools to increase female student participation in these activities. While more research is needed on which types of intramurals have the potential to be the most effective, this research indicates that female-only intramurals could play a part in a comprehensive school physical activity approach that encourages the participation of all students.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2020.101233>.

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