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Differences in High- and Low-Movement Integrating Elementary Classroom Teachers' Physical Activity Promotion Attitudes and Perceived Competence

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Abstract

Movement integration (MI) – infusing physical activity (PA) during normal classroom time – is an evidence-based strategy to simultaneously support children's academic performance and overall healthy development. However, little research has investigated why some teachers integrate movement more than others. This study examined high- and low-movement integrating teachers' PA promotion attitudes and perceived competence. Elementary classroom teachers (N = 128) completed an online survey. High- integrating teachers reported more positive attitudes and higher competence than low- integrating teachers. Preservice preparation, continuing professional development and interventions that foster classroom teachers' positive attitudes and perceived competence related to MI may leverage schoolwide PA promotion.

Keywords:

Classroom-Based Physical Activity, Comprehensive School Physical Activity Program, Elementary School, Beliefs, Perceptions

Introduction

Regular participation in physical activity (PA) has many benefits for children and adolescents, including positive effects on executive functions (De Greeff et al., 2016), selective attention (Altenburg et al., 2016), academic performance (Alhassan et al., 2019; Carson et al., 2017; Harris et al., 2018; Kulinna et al., 2018), reduction of anxiety and depression and improved social development (World Health Organization [WHO], 2015). Conversely, inadequate PA engagement in youth has been associated with negative academic and health consequences, such as poorer working memory, decreased academic achievement, lowered self-esteem and increased social behavior issues (López-Vicente et al., 2017). The Centers for Disease Control and Prevention (CDC) states that children and adolescents should engage in at least 60 minutes of PA per day (CDC, 2013). Unfortunately, most school-age youth do not meet this guideline (National Physical Activity Plan Alliance, 2016). Thus, schools have been identified as a strategic venue to promote PA due

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to ample access to youth, available facilities and teacher interaction with children and adolescents (Warehime et al., 2019; Webster et al., 2017). However, an increase in demand for standardized testing and more time allocated to classroom instruction has led to reductions in traditionally included school-based opportunities for children's PA, including physical education classes (van den Berg et al., 2017; Webster et al., 2017) and recess time (Camahalan & Ipock, 2015; CDC, 2018; Esteban-Cornejo et al., 2017; Harris, et al., 2018) for elementary students. Although the academic, emotional, and physical benefits of PA are undeniable, implementation of PA programs in schools is dwindling.

Most of students' time in school is spent sedentary. Daly-Smith et al. (2020) reported that a large part of the school day consists of seated lessons. It is estimated that students spend anywhere from 50% to 70% of the overall school day in a seated position (Clemes et al., 2016). Egan et al. (2019) found that, based on data from nine studies using objective measures, school-age youth spent an average of 63% of their time in school sedentary. The high proportion of time spent sedentary may be due to the traditionally sedentary nature associated with class lectures, notetaking, testing and other classroom activities (Behrens et al., 2017). The Institute of Medicine (IOM, 2013) has called for a whole-of-school approach to youth PA promotion, most widely conceptualized in the U.S. as the Comprehensive School Physical Activity Program (CSPAP) framework (CDC, 2019; Society of Health and Physical Educators [SHAPE] America, 2015). One of the main objectives of a CSPAP is to increase opportunities for children to participate in PA before, during and after school. A CSPAP is a multicomponent approach to PA promotion encompassing five components: (a) physical education, (b) PA during school, (c) PA before and after school, (d) staff involvement and (e) family and community engagement. The goals of a CSPAP are to: provide opportunities for PA throughout the school day, with physical education as the foundation; provide opportunities for PA before and after school; provide opportunities for school faculty members, families and community members to participate in PA; and increase the understanding and application of skills and knowledge learned in physical education in order to promote a physically active lifestyle (SHAPE America, 2015).

Within the context of a CSPAP, movement integration (MI) has emerged as a key recommendation to involve teachers in promoting children's PA during school (CDC, 2019; SHAPE America, 2015). MI entails incorporating physical activity (PA) during normal classroom time (Webster, Russ et al., 2015). Examples of MI range from using the physical environment of the classroom (e.g., special furniture, placement of materials) to stimulate PA, to increasing PA through physically active transitions, breaks and academic lessons (Moon & Webster, 2019). The prevailing emphasis for MI implementation centers on the general education classroom setting in elementary schools (Webster, 2023; Webster, Russ et al., 2015). MI interventions targeting this context led to numerous positive student outcomes, such as increased classroom-based PA (Leung et al., 2018; Riley et al., 2015; Webster et al., 2018) and improved classroom performance (e.g., on-task behavior, concentration, academic attainment; De Greeff et al., 2016; Mavilidi et al., 2019; Miller & Lindt, 2018; Norris et al., 2018). Furthermore, MI uniquely contributes to children's daily PA levels and generates equal classroom-based PA accrual for boys and girls (Calvert et al., 2018). Despite these benefits, survey data from the School Health Policies and Practices Study in the United States showed that only 11% of elementary schools, 8% of middle schools and 2% of high schools require or recommend that regular classroom PA breaks be provided during the school day (CDC, 2016). This largely leaves the decision about whether to use MI at the level of the teacher. In a nationally representative study, only 27.8% of schools reported having 75% or more of teachers that used MI (Densley et al., 2021). The variability in teachers' use of MI means that some children can benefit from classroom-based PA while other children receive no MI opportunities during the school day.

There could be many reasons why not all teachers use MI or do so at varied rates. In previous studies, numerous factors were associated with elementary classroom teachers' use of MI (Michael et al., 2019; Webster, 2023; Webster, Russ et al., 2015). These factors can be organized into multiple levels of influence (intrapersonal, interpersonal/organizational, community, public policy) using a social-ecological lens (Webster, 2023). However, social-ecological models position intrapersonal factors most proximally to the targeted behavior, suggesting that such factors exert the strongest influence on the behavior (Bronfenbrenner, 1979; McLeroy et al., 1988; Sallis & Owen, 2002). Previous studies with school staff reinforce this idea, showing that personal beliefs and perceptions were more strongly associated with participants' PA promotion than factors at other social-ecological levels (e.g., school support, state policy; Orendorff et al., 2022; Webster & Suzuki, 2014; Webster, Caputi et al., 2013).

One intrapersonal factor that has received extensive investigative attention in research seeking to explain teachers' use of MI is ability beliefs. (Webster, 2023). For example, Webster, Buchan et al. (2015) found that teachers' perceived PA promotion competence (i.e., beliefs about one's own skillfulness in using different MI strategies) predicted their self-reported use of MI (i.e., frequency of using different MI strategies). Such beliefs find footing in the context of multiple theories.

For example, Self-Determination Theory proposes that perceived competence is a basic psychological need that when satisfied, fosters intrinsic motivation, engagement, and persistence regarding a desirable behavior (Deci & Ryan, 1985; Ryan & Deci, 2020). Similarly, Self-Efficacy Theory postulates that individuals' ability beliefs mediate behavior (Bandura, 1977; 1993).

Another intrapersonal factor that has emerged as important to facilitating teachers' use of MI is the perceived importance or value of PA (Michael et al., 2019). According to the Theory of Planned Behavior, attitude (an overall evaluation of a behavior), subjective norms (beliefs about whether others who are significant to us want us to engage in the behavior), and perceived behavioral control (the perception of whether we have control of the behavior) influence intentions, which, in turn, influence behavior (Ajzen, 1985; Fishbein & Ajzen, 1975). Attitude may merit particular focus when considering predictors of teachers' actions. In one study, attitude was twice as influential as subjective norms and three times as influential as perceived behavioral control in explaining teachers' decisions about using educational technology (Lee et al., 2010). Prior MI research indicates that when teachers perceive PA to be valuable (e.g., benefits students, improves on-task behavior), they are more likely to engage in PA promotion (Michael et al., 2019). Yet relatively little research has examined teachers' attitudes toward PA promotion, specifically, and previous studies have not compared teachers' PA promotion attitudes and perceived competence. Webster et al. (2010) investigated these constructs with preservice classroom teachers and found that most participants had favorable attitudes about PA promotion but reported varying degrees of perceived competence. Comparing in-service teachers' attitudes and perceived competence would help to identify whether either of these intrapersonal factors warrant increased support in continuing professional development initiatives and future intervention programming.

Beyond the need to compare classroom teachers' PA promotion attitudes and perceived competence, little is known about how such perceptions might differ for teachers who use comparatively more and less MI on a routine basis in their classrooms (Webster et al., 2017). Foran et al. (2017) stated that the unique views of teachers who voluntarily implement PA are important for promoting MI practices. Similarly, the perceptions of teachers who are less prone to integrate movement merit increased attention. A developing strand of MI research is beginning to distill the distinct profiles and needs of different classroom teachers. For example, an intervention to increase PA promotion during school was designed specifically for elementary classroom teachers who self-reported using comparatively little MI at their respective grade levels (Egan et al., 2018; Webster et al., 2017; 2018). Another study used latent profile analysis to classify teachers, based on their perceptions about MI (e.g., benefits, barriers, satisfaction, feasibility; Webster et al., 2020). Understanding and explaining differences in elementary classroom teachers' use of MI is important to develop appropriately tailored and effective professional development and intervention programming for increasing the use of MI as a schoolwide PA promotion strategy. Moreover, such information can help to advance a general theory of MI by lending further descriptive knowledge concerning the association between classroom teachers' intrapersonal characteristics and implementation profiles (Webster, 2023).

In summary, previous studies provide limited information that can be used to compare classroom teachers' PA promotion competence and attitudes, which are both key intrapersonal factors in predicting classroom teachers' use of MI. Furthermore, owing to several recent studies that have documented distinct qualities of different classroom teachers, it has become apparent that continued research is needed to better understand how teachers' MI implementation profiles and intrapersonal characteristics may be linked. To address these gaps in the knowledge base, the purpose of this study was to examine high- and low-movement integrating classroom teachers' PA promotion attitudes and perceived competence. The specific research questions for this study were (a) "What characterizes teachers' PA promotion attitudes and perceived competence?" and (b) "Are there statistically significant differences in the PA promotion attitudes and perceived competence when comparing high- and low- movement integrating teachers?"

Methods

This study, which was based on data used for the first author's doctoral dissertation, employed a causal-comparative research design and was conducted in line with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement checklist and guidelines for cross-sectional studies (von Elm et al., 2007; Vandenbroucke et al., 2007). The dependent variables were PA promotion attitudes and perceived competence. The independent variable was teachers' use of MI (dichotomized as low-movement integrating and high-movement integrating, hereafter referred to as "high MI" and "low MI").

Participants and Setting

The population and the unit of analysis for this study was elementary (Kindergarten through Grade 6) classroom teachers. The target population was 800 elementary classroom teachers in two different school

districts in the southwestern United States, based on the first author's previously established relationship with these districts. Using G*Power Analysis, the appropriate sample size for this causal-comparative study which employed the use of an independent samples t-test was 128 teachers (64 low MI and 64 high MI). The targeted effect size for this study was 0.5 (two-tailed) with an error probability of 0.05 and power of .80. Therefore, 128 teachers were recruited for this study. Participants self-reported age, gender and teaching experience were similar between low and high MI groups. Specifically, low MI participants' mean age was 46.44 (*SD* = 10.63), while high MI participants' mean age was 43.33 (*SD* = 9.78). The gender breakdown for each group was 53 female and 9 male participants in the low MI group (with one participant choosing not to disclose their age and one missing value) and 58 female and 5 male participants in the high MI group (with one missing value). The average years of teaching experience was 15.51 (*SD* = 8.88) for the low MI group and 15.62 (*SD* = 8.04) for the high MI group. Additional demographic and background information for the study participants is provided in Table 1.

Instrumentation

Teachers' use of MI. The Physical Activity in the Academic Classroom (PAPAC) questionnaire (Webster, Caputi et al., 2013) was used to assess the frequency of teachers' use of MI. PAPAC is a self-report measure that includes six items that ask participants to report how often they use different types of MI practices (e.g., integration of PA into academic lessons, movement breaks). A five-point Likert-type scale is used with the response options "Never", "Rarely", "Sometimes", "Often" and "Very Often". The instrument was found to demonstrate good validity and reliability in previous research with elementary classroom teachers (Webster, Erwin et al., 2013; Webster, Buchan et al., 2015). For the current dataset, the measure had an internal consistency of $\alpha = 0.81$.

PA promotion attitudes. Teachers' attitudes toward PA promotion were assessed via self-report using the School Physical Activity Promotion Attitudes Questionnaire (SPAPAQ; Webster et al., 2010). The measure consists of nine items that ask participants about their attitudes toward the importance of school-based PA promotion (e.g., "Physical education is an important part of the elementary school curriculum", "Recess is an important part of the school day") and the importance of classroom teachers serving as PA promoters ("Elementary classroom teachers should play a major role in physical activity programs at school", "It is important for me as a classroom teacher to be physically active"). A four-point Likert-type scale is used with the response options "Strongly Disagree", "Disagree", "Agree" and "Strongly Agree". Webster et al. (2010) previously reported satisfactory psychometric properties for the instrument with a sample of preservice classroom teachers. The internal consistency of the measure for the present study was $\alpha = .78$.

PA promotion competence. Perceived competence to use MI was assessed using the School Physical Activity Promotion Competence Questionnaire (SPAPCQ; Webster, Buchan et al., 2015). SPAPCQ is a self-report measure that consists of five items, which ask participants to rate their level of skill in performing different PA promotion tasks in the academic classroom (e.g., create opportunities for students to participate in safe PA in the classroom, integrate PA into academic lessons, incorporate movement breaks in the classroom). The response options are "None", "Few", "Some", "Enough" and "Many". These options fall along an eight-point rating scale on the original instrument, but we used a five-point scale in the present study to increase consistency across our measures. In previous research with elementary classroom teachers, Webster, Buchan et al. (2015) reported adequate results for the instrument's validity and reliability in another study with elementary classroom teachers. The internal consistency of the measure for the present study was $\alpha = .91$.

Procedures

Approval to conduct the study was obtained from the first author's university Institutional Review Board, the two school districts and each school in these districts prior to collecting data. Survey Monkey was used to administer the survey. A recruitment email with the survey link was sent to all elementary classroom teachers in the two school districts selected for this study. The first page of the survey provided information about the study and served as informed consent. Subsequent pages of the survey included the PAPAC questionnaire, the SPAPAQ, the SPAPCQ, and demographic, background and school context items. The survey remained open for six weeks and eight reminders were sent to maximize the response rate until the minimum sample size (64 low MI teachers and 64 high MI teachers) was met. For the purposes of this study, a high MI teacher was defined as having a mean PAPAC score equal to or higher than 3.1 and a low MI teacher was defined as having a PAPAC score equal to or lower than 2.9. Survey respondents with a mean PAPAC score of 3 were not used in this study.

Data Analysis

All survey responses were compiled and downloaded from Survey Monkey into an Excel spreadsheet and uploaded to SPSS (v.28) for data cleaning and analysis. Descriptive statistics were calculated for all survey items. Levene's test for both PA promotion attitudes, and perceived competence revealed a non-significant score based on an alpha value of 0.05. The attitudes score was $F(1, 126) = 0.225$, $p = .636$ and the perceived competence score was $F(1, 126) =$

2.73, p = .101. Besides the minor overage in the kurtosis value (-1.08) for low MI teachers' competence scores, both skewness and kurtosis were within ± 1.0. Based on information presented by Ho and Yu (2015), a kurtosis score lower that 3 still indicates an acceptable level of kurtosis. Thus, the skewness and kurtosis measurements indicated the data met the assumption of normality. Additionally, the homogeneity of variance provided by the Levene's test indicated homogeneity of the sample data. Therefore, mean differences in the dependent variables (SPAPAQ and SPAPCQ scores) by group (high versus low MI teachers) were calculated using a two-tailed independent samples t-test. A p-value of .05 was set to determine statistical significance.

Results

Descriptive Statistics

Descriptive statistics for participants' responses to all items pertaining to teachers' use of MI, PA promotion attitudes, and PA promotion competence are displayed in Table 2. For teachers' use of MI, high MI teachers reported higher frequency of using each MI strategy than low MI teachers. Both groups reported incorporating movement breaks more than integrating PA opportunities into academic lessons. In terms of attitudes toward PA promotion, high MI teachers scored higher on all items with the most notable differences for attitudes about whether classroom teachers should play a major role in school-based PA programs, can make a significant difference in helping children adopt lifetime PA habits, should provide PA for children daily and the importance of classroom teachers being physically active. High MI teachers also scored higher on all items related to PA promotion competence, indicating higher perceived competence to use each of the different MI strategies included on the measure. The largest between-group differences in PA promotion competence were for competence in integrating PA opportunities into academic lessons and competence in modifying low active indoor games to make them more physically active for all players.

Differences in PA Promotion Attitudes and Perceived Competence

There was a statistically significant difference between high and low MI teachers' PA promotion attitudes and perceived competence (Table 3). The effect size for the difference in attitudes can be interpreted as medium, while the effect size for the difference in perceived competence can be interpreted as large (Cohen, 1988), suggesting that the results have practical significance.

Table 1

Additional Demographic and Background Information

Variable	Low MI	High MI
Grade Taught		
Kindergarten	0	3
First Grade	8	13
Second Grade	12	11
Third Grade	11	11
Fourth Grade	12	7
Fifth Grade	8	11
Sixth Grade	12	6
Missing	1	2
Ethnicity		
White	53	53
Hispanic	7	9
Asian	1	0
Other	1	1
Missing	2	1
Highest Academic Degree		
Bachelors	28	20
Masters	35	41
Specialist	0	1
Doctorate	0	1
Missing	1	1
Formal MI Training		
Yes	10	31
No	53	32
Missing	1	1
Played Sport		
Yes	46	55
No	17	8
Missing	1	1
Coached Sport		
Yes	22	32
No	41	31
Missing	1	1

Note. MI = movement integration.

Table 2

Descriptive Statistics for the PAPAC Questionnaire, SPAPAQ and SPAPCQ

Variable	M	SD	n	SE_M	Min	Max	Skewness	Kurtosis
PAPAC Questionnaire								
How often you integrate physical activity opportunities into math lessons?								
Low	2.22	0.86	64	0.11	1.00	4.00	0.31	-0.52
High	3.59	0.66	63	0.08	3.00	5.00	0.68	-0.59
How often do you integrate physical activity opportunities into language arts lessons?								
Low	2.25	0.73	64	0.09	1.00	3.00	-0.42	-1.03
High	3.48	0.67	63	0.08	2.00	5.00	0.74	-0.12
How often do you integrate physical activity opportunities into science lessons?								
Low	2.61	0.85	64	0.11	1.00	5.00	0.05	0.09
High	3.57	0.69	63	0.09	2.00	5.00	0.19	-0.31
How often do you integrate physical activity opportunities into social studies lessons?								
Low	2.25	0.76	64	0.09	1.00	4.00	0.00	-0.52
High	3.27	0.65	63	0.08	2.00	5.00	0.37	0.27
How often do you facilitate physically active exercises such as a "warm-up" routine for students in your classroom (i.e., that is not part of a school wide activity)?								
Low	2.00	0.84	64	0.10	1.00	4.00	0.16	-1.15
High	3.43	1.01	63	0.13	1.00	5.00	-0.18	-0.77
How often do you incorporate movement breaks (e.g., activity transitions, "energizers" between lessons in your classroom?								
Low	3.22	0.84	64	0.11	1.00	5.00	-0.11	-0.26
High	4.27	0.63	63	0.08	2.00	5.00	-0.66	1.31
Total PAPAC Score								
Low	2.43	0.37	64	0.05	1.33	2.83	-1.26	1.21
High	3.60	0.40	63	0.05	3.17	4.83	1.15	1.10
SPAPAQ								
Physical education is an important part of the elementary school curriculum.								
Low	3.62	0.60	64	0.08	1.00	4.00	-1.80	4.04
High	3.81	0.59	63	0.07	1.00	4.00	-3.70	14.00
Recess is an important part of the school day.								
Low	3.75	0.59	64	0.07	1.00	4.00	-2.67	7.45
High	3.92	0.41	63	0.05	1.00	4.00	-6.08	38.58
Elementary classroom teachers should play a major role in physical activity programs at school.								
Low	2.73	0.76	64	0.10	1.00	4.00	-0.39	-0.03
High	3.05	0.66	63	0.08	2.00	4.00	-0.05	-0.66
Elementary classroom teachers can make a significant difference in terms of helping children to adopt lifetime physical activity habits.								
Low	3.00	0.62	64	0.08	1.00	4.00	-0.41	1.00
High	3.40	0.52	63	0.07	2.00	4.00	0.08	-1.24
Elementary classroom teachers should provide physical activity for students daily as part of the school day.								
Low	2.86	0.64	64	0.08	1.00	4.00	-0.98	1.92
High	3.27	0.65	63	0.08	1.00	4.00	-0.68	0.94
Other school subject areas are more important than physical education.								
Low	2.67	0.69	64	0.09	1.00	4.00	0.24	-0.51
High	2.22	0.68	63	0.09	1.00	4.00	0.31	0.16
Adults who had good elementary physical education programs will be more active.								
Low	2.84	0.67	64	0.08	1.00	4.00	-0.13	-0.13
High	2.95	0.61	63	0.08	2.00	4.00	0.02	-0.26
It is important for me as a classroom teacher to be physically active.								
Low	3.17	0.63	64	0.08	1.00	4.00	-0.53	1.08
High	3.43	0.56	63	0.07	2.00	4.00	-0.27	-0.91
It is important for me as a classroom teacher to be physically fit.								
Low	3.05	0.65	64	0.08	1.00	4.00	-0.39	0.54
High	3.21	0.74	63	0.09	1.00	4.00	-0.58	-0.20
Total SPAPAQ Score								
Low	3.08	0.33	64	0.04	2.33	3.78	-0.0006	-0.26
High	3.25	0.33	63	0.04	2.56	3.89	-0.07	-0.71
SPAPCQ								
Create opportunities for my students to safely participate in physical activity in my classroom.								
Low	3.66	1.57	64	0.20	0.00	6.50	-0.53	-0.68
High	4.72	1.39	63	0.17	1.50	6.50	-0.69	0.14
Integrate activity opportunities into academic lessons (e.g., math, language arts, science).								
Low	3.00	1.60	64	0.20	0.00	6.50	0.23	-1.00
High	4.46	1.24	63	0.16	1.50	6.50	-0.76	0.55
Incorporate movement breaks (e.g., activity transitions, "energizers") between lessons in my classroom.								
Low	4.31	1.59	64	0.20	1.50	6.50	-0.39	-0.71
High	5.25	1.18	63	0.15	1.50	6.50	-0.65	0.006
Facilitate physically active exercises, such as a "warm-up" routine, for students in my classroom.								
Low	3.31	1.89	64	0.24	0.00	6.50	-0.27	-1.19
High	4.36	1.70	63	0.21	0.00	6.50	-0.40	-0.58
Modified low active indoor games (e.g., Hot Potato) to make them more physically active for all players.								
Low	2.98	1.82	64	0.23	0.00	6.50	0.48	-1.07
High	4.21	1.63	63	0.20	1.50	6.50	-0.16	-0.87
Total SPAPCQ Score								
Low	3.45	1.39	64	0.17	0.90	6.50	0.08	-1.08
High	4.60	1.23	63	0.15	1.50	6.50	-0.42	-0.38

Note. PAPAC = Physical Activity Promotion in the Academic Classroom; SPAPAQ = School Physical Activity Promotion Attitudes Questionnaire; SPAPCQ = School Physical Activity Promotion Competence Questionnaire.

Table 3
Two-Tailed Independent Samples t-Tests for SPAPAQ and SPAPCQ Scores by Group

	Low MI Teachers		High MI teachers				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Attitude	3.08	0.33	3.24	0.33	-2.85	.005	0.50
MI Competence	3.45	1.39	4.58	1.23	-4.86	.001	0.86

Note. n = 128; degrees of freedom for the t-statistic = 126; d represents Cohen's d; SPAPAQ = School Physical Activity Promotion Attitudes Questionnaire. SPAPCQ = School Physical Activity Promotion Competence Questionnaire.

Discussion

Despite the myriad benefits of MI, there is a lack of classroom-based MI practices nationwide (Densely et al., 2021). This may partly be due to teachers' perceived barriers to using MI, such as a lack of training (Benes et al., 2016), knowledge (Stewart et al., 2019) and resources (Webster et al., 2017). Additionally, teachers reported a lack of time (Dinkel et al., 2016; Naylor et al., 2015; Webster et al., 2018) owing to an overcrowded curriculum because of academic pressures such as standardized testing (Benes et al., 2016; Cothran et al., 2010; Köykkä et al., 2019; Michael et al., 2019). In the absence of MI, students may be spending large amounts of time learning in a sedentary fashion (Clemes et al., 2016). Identifying factors that differentiate teachers in their rate of MI use is necessary to advance MI theory, teacher professional development, and interventions that aim to increase children's daily PA during school (Webster, 2023). The present study examined high and low MI elementary classroom teachers' PA promotion attitudes and perceived competence to build upon a burgeoning descriptive knowledge base that has identified teachers' attitudes and perceived competence as key factors in facilitating MI implementation (Michael et al., 2019; Webster, 2023) and increasingly demonstrated a need to understand how teachers' implementation profiles and intrapersonal characteristics are connected (Egan et al., 2018; Webster et al., 2017; Webster et al., 2018; Webster et al., 2020).

Whereas previous studies have consistently shown variability in the extent to which different teachers use MI (e.g., Densley et al., 2021; Turner & Chaloupka, 2017), little research has compared high and low MI teachers. The results of the present study show practically meaningful differences in high and low MI teachers' PA promotion attitudes and perceived competence, which can be further understood by examining the specific items on all three measures used in this investigation. First, high MI teachers used all MI strategies from the PAPAC questionnaire more than low MI teachers, suggesting that professional development and intervention programming should focus on supporting low MI teachers in their use of each of these strategies. Both the high and low MI groups reported using movement breaks more than active lessons. It is possible that active lessons are more challenging to adopt than movement breaks. Moon and Webster (2019) conceptualize MI strategies as a learning progression for teachers, placing active lessons at a higher level than movement breaks in the progression, based on the assumption that learning to integrate PA into academic lessons requires more time, resources and support than learning to incorporate movement breaks. However, further research is needed to investigate the affordances and demands of implementing different MI strategies.

Second, scores on the SPAPAQ most notably varied between high and low MI teachers with respect to attitudes about the role and responsibilities of classroom teachers in school-based PA promotion, the difference classroom teachers can make in supporting children's adoption of a physically active lifestyle and whether classroom teachers should be physically active themselves. In particular, the mean scores for items stating that classroom teachers should play a major role in school-based PA programs and should provide PA for children daily during school were below the scale median for the low MI teachers, indicating overall disagreement with these perspectives. This is concerning because whole-of-school approaches, such as CSPAPs, are recommended to increase and promote the PA of all school-aged youth and such approaches depend largely on strong support from, and continuous involvement of, classroom teachers and other school professionals beyond physical educators (CDC, 2019; SHAPE America, 2015). We therefore recommend that persuasive messaging that emphasizes the critical role of classroom teachers in providing children with MI opportunities every school day should be a prominent part of preservice teacher education, in-service professional development and interventions related to school-based PA promotion.

It was also unfortunate to see that, on average, both groups of teachers disagreed on the SPAPAQ item stating that adults who had good elementary physical education programs would be more physically active. A study of 1028 adults in the U.S. found that participants' retrospective enjoyment of physical education was associated with their current attitudes and intentions related to PA and self-reported weekend sedentary time (Ladwig et al., 2018). Additionally, previous research with pre-service classroom teachers (Webster et al., 2010), inservice classroom teachers (Webster,

Buchan et al., 2015) and school principals (Orendorff et al., 2022) found that satisfaction with personal K-12 physical education experiences was associated with PA promotion involvement. In the study by Webster, Buchan et al. (2015), self-reported participation in PA was a predictive factor in elementary classroom teachers' use of MI. Overall, these findings suggest the long-term influence of physical education on school professionals' attitudes and behaviors related to whole-of-school PA programming merits increased attention in future research. It is clear, however, that preservice programs, teacher professional development and interventions need to incorporate opportunities for discussion about personal experiences in physical education, distinguish between quality and inferior physical education programs and justify the important educational value and potential lifelong positive impact of quality physical education.

Third, as with the PAPAC measure, high MI teachers scored higher on all items of the SPAPCQ. Between-group differences were more pronounced for perceived competence than for attitudes. Most notable were disparities for items assessing competence to integrate PA into academic lessons and modify games to make them more active for all students. The lack of perceived competence for teaching physically active lessons is not surprising, given this was identified as a relatively low-use strategy from the PAPAC results. To address low perceived competence for modifying low active games, authors have suggested using the LET US Play principles (Weaver et al., 2013). LET US is an acronym that stands for Lines (avoid putting children in line), Elimination (do not play games in which children are eliminated), Team size (keep the size of teams/groups small), Uninvolved staff, (staff should use active supervision and move around the play area) and Space and other resources (maximize use of space, equipment, people, etc.). These principles have supported effective interventions for increasing elementary students' PA during game play (Brazendale et al., 2015) and in after school programs (Beets et al., 2018). Future research should investigate the effects of MI trainings that include the LET US Play principles on classroom teachers' MI implementation and students' PA.

The results of this study are broadly applicable to those who are in a position to support teachers in implementing schoolwide PA programming (e.g., a CSPAP). School administrators, teacher educators, and researchers/interventionists should identify and work to specifically support elementary classroom teachers whose PA promotion attitudes and perceived competence are relatively unfavorable/low. In previous research, mastery experiences were positively associated with elementary classroom teachers' individual efficacy to integrate movement (Parks et al., 2007), and evidence with preservice classroom teachers suggests that it is possible to evoke positive changes in PA promotion attitudes and perceived competence with appropriate educational training (Webster, 2011). Yet, little investigative attention has been given to how in-service classroom teachers who use more versus less MI may respond differently to professional development related to promoting children's PA. Such research is critical to designing customized teacher support to increase schoolwide PA promotion (Egan et al., 2018; Todd et al., 2015; Webster et al., 2017). Furthermore, a recent review found that most MI interventions were researcher-driven with little opportunity for teacher input (Vazou et al., 2020). Interventions which use a more collaborative approach between researchers and teachers may help to promote low MI teachers' PA promotion competence.

This study had several limitations. First, while there was variability across participants on several background and contextual variables, the use of convenience sampling limits the generalizability of the results. Second, teachers' use of MI was assessed by self-report. We recommend the use of more objective measures in future research. For example, the System for Observing Student Movement in Academic Routines and Transitions (SOSMART; Russ et al., 2017) was designed to systematically capture instances of MI in elementary general classroom settings. Third, while in this investigation we examined attitudes and perceived competence as two key intrapersonal variables related to teachers' use of MI, it is possible that a more thorough exploration of the study's theoretical foundations would provide further insights about differences in high and low MI teachers' perceptions and beliefs. One potentially useful direction could be focusing on all three independent variables of the Theory of Planned Behavior (attitudes, subject norm, and perceived behavioral control) in relation to teachers' MI practices. For instance, with respect to subjective norm, past research suggests that school administration and fellow teachers have an effect on teachers' MI behaviors (Lee & Welk, 2019; Moon & Webster, 2019; Turner & Chaloupka, 2017; Warehime et al., 2019). Finally, the data for this study were collected during the COVID-19 pandemic in 2020. At the time the surveys were sent out, many of the teachers that participated in this study were conducting class virtually. This might have impacted teachers' MI practices as well as their beliefs and attitudes about incorporating MI in the classroom due to any unique challenges experienced with online teaching/learning.

Conclusion

This study expands upon research that considers intrapersonal factors related to elementary classroom teachers' use of MI, which has found that such factors

play an important role in teachers' PA promotion behaviors (e.g., Centeio et al., 2022; Michael et al., 2019; Nader et al., 2019; Parks et al., 2007; Vazou & Vlachopoulos, 2014). Moreover, this study uniquely advances MI research in its focus on the distinctive attributes of classroom teachers categorized as high MI versus low MI. Understanding such distinctions must continue to be a priority in theoretical, empirical and practical pursuits related to the implementation of schoolwide PA promotion. Low MI teachers' attitudes and perceived competence should be viewed as important constructs for continued investigation in tandem with evolving efforts to improve interventions and teacher professional development that aim to cultivate more physically active school environments.

Future research will benefit from using experimental designs that build on the causal comparative results of the present study and help to more clearly establish causal relationships between teachers' MI perceptions (attitudes and beliefs) and behaviors. In addition, future MI research should extend to secondary school settings. The CDC (2016) reported that as students get older, there are fewer opportunities for PA in school. Concurrently, PA levels precipitously decline from childhood to adolescence (Husøy et al., 2024; Nader et al., 2008). For example, Husøy et al. (2024) found in a longitudinal study of 731 Norwegian youth that between ages 9 and 15, the time participants spent in light, moderate, and vigorous PA per day decreased by 125 minutes, 16 minutes, and 8 minutes, respectively. Yet relatively few studies of MI have focused on middle and high school classrooms (Jørgensen et al., 2020; McMichan et al., 2018; Romar et al., 2020; Schmidt et al., 2022; Stoepker & Dauenhauer, 2020; Warehime et al., 2019). Ultimately, understanding the dynamic interplay between key contextual variables (e.g., teacher, students, academic subject, grade level, administrator support, school policies) as it relates to teachers' use of MI is essential for developing an empirically robust theory of practice that can drive the institutionalization of MI as a routine part of classroom time in schools (Webster, 2023).

Declarations

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Disclosure of Potential Conflicts of Interests

The authors have no relevant financial or non-financial interests to disclose.

Ethics Approval and Informed Consent

The Grand Canyon University Institutional Review Board approved this study, and all participants provided written informed consent prior to data collection.

Author Contributions

The first author contributed to study conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, validation, visualization, writing – original draft, and writing – review & editing. The second author contributed to conceptualization, formal analysis, investigation, methodology, supervision, and writing – review & editing. The third author contributed to conceptualization, investigation, methodology, and writing – review & editing.

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