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Evaluating Adolescents' Reasons to Participate in Physical Activity: Alternative Approaches and Alternative Benefits

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Abstract

The purpose of the study was to examine reasons to participate as precursors to increasing physical activity of adolescents who are low active and/or have an unhealthy weight status. Adolescents (N = 173) from an urban high school were grouped by two composite measures of weight status-perceived fitness, and effort-involvement physical activity. Adolescents completed an adapted eight-question survey based on Kenyon's (1968) multidimensional evaluative model of physical activity. Profile analyses examined group mean differences for reasons to participate and a one-way ANOVA examined group mean differences for physical activity behavior. For the reasons to participate profiles, the weight-status perceived-fitness groups reported significant differences for the tests of levels and flatness. The effort-involvement physical activity groups reported significantly different parallel profiles, levels, and flatness. For physical activity behavior, the weight-status perceived-fitness groups reported significant mean differences. We discussed the practical implications of grouping weight-status with perceived-fitness to reflect lifestyle, and the importance of light effort as part of the effort-involvement physical activity variable. We also examined the practical implications for physical educators and physical activity leaders of the different and common evaluative profiles, and physical activity behavior of adolescents for health benefits, and other participatory reasons.

Keywords

Profile Analysis, Overweight, Obesity, Lifestyle Physical Activity, Health Benefits, Attitudes

1. Introduction

To increase physical activity (PA) in children and adolescents for health benefits the *Physical Activity Guidelines for Americans* (PAGA; Department of Health and Human Services [DHHS], 2018) recommended daily challenges of engaging in 60 min or more of PA composed of moderate or vigorous intensity (MVPA), and muscle and bone strengthening. These recommendations pose substantial challenges for adolescents, especially those who are low active and/or overweight and obese. Encouragingly, initiating and sustaining the challenges of daily PA should be easier than ever before given the access to an abundance of PA opportunities. However, as access does not guarantee opportunity, adolescents who are low active and/or overweight and obese need to be encouraged to realize their opportunities and personally commit to becoming more physically active.

As choosing a PA is very much a decision of personal preference, we examined attitudes as personal precursors to increasing PA behavior for health benefits, especially of adolescents who are low active and/or overweight and obese. We identified four studies that previously examined attitudes and behavior (Craeynest et al., 2005; Deforche et al., 2004; Ickes & Sharma, 2012; Kamtsios & Digelidis, 2008) with these populations. Attitudinally there were no between group differences reported by Craeynest et al. (2005), Ickes & Sharma (2012), and Kamtsios & Digelidis (2008). Only Deforche et al. (2004) reported significant, but decreased changes in attitudes for three of 11 benefits and barriers in an intervention study of 24 obese adolescents. In the three studies that also measured increases in PA behavior Kamtsios & Digelidis (2008), and Deforche et al. (2004) reported significant and expected group differences, whereas Ickes & Sharma (2012), who directly examined the attitude-behavior relationship, found that PA correlated to subjective norm rather than to attitudes. Only Craeynest et al. (2005), in explaining the lack of group differences between matched pairs of obese and normal weight children for health-based attitudes towards PA, identified that other participatory reasons rather than just health benefits may be necessary. As a result, we considered that a broader participatory reasoning approach to attitudes and PA behavior was important in developing this study.

Our broader participatory approach focused on Kenyon's (1968) long-established model of PA as targeted behavior and reason to participate (RP) as the action element determined from univocal dimensions (social, vertigo, ascetic, aesthetic, cathartic, and health and fitness). Rhodes & Nigg (2011), when advancing the case of health benefits of PA, considered that Kenyon's model remained behaviorally relevant as a flexible and wide-ranging determinant of PA. However, there is a long history of Kenyon's PA model being the operand in examining the attitude-behavior relationship, but with varying success. Kopczynski et al. (2014) applied Kenyon's model when studying PA attitudes and behavior between healthy-weight and obese adolescents, but their results were non-significant. Encouragingly, effective application of Kenyon's model was evident in studies by Schutz et al. (1981) and Hagger et al. (1997) that produced the most interesting

attitude-behavior results relevant to this study. Both sets of researchers examined two very different groups of children determined by measures of PA behavior, and reported multidimensional attitudinal factors that identified complex participation reasoning towards PA. Interestingly, both sets of researchers focused their conclusions on the validity of Kenyon's univocal dimensions rather than the multidimensionality of the attitudes (Peters, 2014). By focusing on the multidimensional results of Schutz et al., and Hagger et al., we contend that it is plausible to participate in PA for a variety of reasons with the possible combination of dimensions ranging from multiple RP for a single PA at one extreme, to one RP for multiple PA at the other. Unfortunately, the possibility of the latter extreme is impossible within surveys with forced-choice responses, such as in the Children's Attitude towards PA (CATPA, Schutz et al., 1985). An additional complication in the CATPA survey was that the range of RP combinations becomes permutations, as the six questions and five Likert-type answer options, allowing for repetition and specific order, yields 15,625 permutations of RP towards PA (RPPA). Currently, we can only acknowledge these levels of permutation when analyzing attitudinal evaluations towards RP, but this did precipitate our search for alternative and manageable approaches to account for PA multidimensionality. Accepting that an attitude is an evaluative response to a compatible action and targeted behavior, our first alternative approach was to undertake profile analysis to maintain multidimensionality when examining the evaluative responses to the independent dimensions of RPPA between groups. This alternative aligned with Schutz et al.'s (1985) recommendation not to generate a composite attitudinal score from the evaluations of Kenyon's PA dimensions.

We also reconsidered the extensive use of BMI as a grouping variable when determining adolescents who are overweight and obese (Demetriou, 2017; Nooijen et al., 2017; Craeynest et al., 2005; Deforche et al., 2004; Ickes & Sharma, 2012; Kamtsios & Digelidis, 2008). Our alternative was based on Janiszewski's (2012) contention that BMI does not differentiate between the "Michelin Man and The Terminator" (Heading #1), and does not reflect lifestyle, as in the case of a high school football lineman who is highly active, but obese. To examine Janiszewski's (2012) contention, we cross-tabulated data from Youth Risk Behavior Survey (YRBS; Kann et al., 2018) for adolescents identified as normal, overweight and obese (Barlow et al., 2007) with the number of days that they achieved 60 min of MVPA as a behavioral or lifestyle measure. The results of three separate one-way Chi-square analysis, presented in **Table 1**, indicated that adolescents who were obese, overweight, and normal weight reported significantly unequal levels of PA across the eight-day options for completing MVPA. Based on these results, we decided to apply behavioral or lifestyle measures as moderating factors on BMI. Such alternative moderating factors previously have included aerobic endurance (Boddy et al., 2010), cardio-vascular fitness (Mitchell et al., 2012), and dissatisfaction with body weight (Sampasa-Kanyinga et al., 2017).

Table 1. Cross-Tabulation and Chi-square Analyses from Youth Risk Behavior Survey (YRBS, Kann et al., 2018).

BMI Percentage Groups[1]	During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Q79 YRBS, Kann et al., 2018)								One-way Chi-square
	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	
Obese (95%+, n = 1879)	363	147	219	234	203	248	110	355	236.73***
Overweight (85% - 94%, n = 1838)	281	136	214	232	187	259	109	420	283.47***
Normal Weight (6% - 84%, n = 8451)	1227	625	793	982	823	1146	581	2224	1856.80***

Note. [1]From YRBS questions: QNobese; QNOwt; and bmipct. *** = $p < 0.001$.

However, of most interest in the development of this study was the approach of Martins et al. (2010), who developed cross-tabulated grouping variables that combined two levels of weight status (non-overweight and overweight/obese) with two measures of fitness (unfit and fit). Their results indicated that, irrespective of weight status, the fit adolescents outperformed the unfit adolescents on measures of cardiorespiratory fitness. As maintaining fitness is a lifestyle choice, we developed a cross-tabulated grouping variable as a moderating and alternative approach in this study.

The purpose of the study was to examine RP as precursors to increasing PA of adolescents who attended an urban high school from a mid-west state in the USA. For the first hypothesis, we focused on RP as an evaluation of PA, and moderated BMI with a perceived fitness variable. The first hypothesis was that there would be profile differences in evaluative responses on the RPPA survey for adolescents grouped by a composite weight-status perceived-fitness variable. The development of the second hypothesis adopted Schutz et al.'s (1981) and Hagger et al.'s (1997) grouping of participants based on levels of reported PA behavior. The second hypothesis was that there would be profile differences in evaluative responses on the RPPA survey for adolescents grouped by a behavior measure of effort-involvement PA. For both hypotheses, the expectation was that there would be significant non-parallel group differences across the RPPA profiles; that the between-group levels would be significantly different and hierarchical; and that the analysis of flatness would report within-subject differences across the eight RPPA dimensions. The third hypothesis was that there would be mean differences on effort-involvement PA, as a behavior variable, for adolescents grouped by weight-status perceived-fitness levels.

2. Method

2.1. Setting and Participants

Adolescent students, grades 9 - 12, from an urban high school in a mid-western state of the U.S.A. took part in the study. According to the State's Department of Education the school classified as urban based on a large student population

with high levels of poverty. The participants were a convenience sample from the school's Family and Consumer Sciences (FCS) teaching block. In accordance with the University's Institutional Review Board (IRB), to participate in the study the adolescents were required to return a signed parental consent form and complete a child assent form. The sample of 173 adolescents (girls n = 105, boys n = 68; M_{age} = 16.20, SD = 1.46; grade level 9 = 41, 10 = 58, 11 = 49, 12 = 21; White n = 64, Black n = 37, Hispanic n = 27, Asian and Pacific Islander n = 8) participated in the study. The sample demographics of gender, grade and ethnicity were all indicative of the school's general student population as reported in the School District's data dashboard.

The IRB approved assent form indicated an option for participants to decide not to answer either specific questions or whole surveys, and this resulted in 173 participants completing the specific surveys questions required to be included in this study. However, three sub-samples resulted from different response rates of questions required to determine group placement. For the first hypothesis, only 121 of the 173 adolescents reported height, weight, and date of birth that allowed calculation of BMI percentage as weight status, and completed the RPPA survey. A sub-sample of 169 adolescents answered the two questions about PA behavior. "In the last 7 days, what kind of physical activities have you done outside of school?" and "How many minutes are YOU active each day?" for the second hypothesis. For the third hypothesis, a sub-sample of 126 adolescents completed the questions about PA behavior and questions to determine weight status.

2.2. Procedures and Instruments

Multi-class administration of the surveys took place over a two-week period in the fourth quarter of the academic year. The adolescents completed two surveys administered in FCS classes separately on different days. The data collection was staggered as surveys were completed during class time and teachers preferred to balance class time between survey completion and regular classwork.

Reasons to Participate in Physical Activity (RPPA) Survey

We developed the RPPA survey for adolescents based on Kenyon's (1968) PA dimensions within the format of the CATPA (Schutz et al., 1985) survey. The purpose of the RPPA survey was to generate single evaluations for RP relevant to adolescents with varying PA preferences and levels of involvement. Each question included the prefix "How do you feel about taking part in…". **Table 2** presents our choices and rationale for the inclusion for each RP dimension that accounted for the domains of Kenyon's PA model and current behaviors and approaches to PA.

Our choice of one scale for each dimension was due to the ease and efficiency of completing the survey by adolescents who were also completing a number of other surveys during the data collection phase of the study. Our choice of an experiential factor (Fishbein & Ajzen, 2010) for the single unidimensional evaluative scale aligned to the underlying evaluative dimension, which was for the adolescents to report their feelings about reasons to participate.

Table 2. Rationale for the dimensions and questions of the Reasons to Participate in Physical Activity (RPPA) survey.

Physical Activity Dimensions	RPPA Questions	Inclusion rationale for survey questions
Social Growth[1]	Q1. How do you feel about taking part in physical activities that provide a chance to meet new people?	This question was part of Schutz et al.'s (1985) CATPA survey and considered social growth as it leads to forming friendships.
Health & Fitness[1]	Q2. How do you feel about taking part in physical activities to make you healthier or fitter?	This question aligned with Schutz et al.'s (1981) health and fitness value. We considered this as a generic of all forms of health-related fitness.
Vertigo[1]	Q3. How do you feel about taking part in physical activities to move very fast and must change direction quickly?	This question was adapted from Schutz et al. (1985) by excluding risk of danger and targeted at PA that requires the skill-related fitness component of agility.
Ascetic[1]	Q4. How do you feel about taking part in physical activities to be strong and fit?	This question was included to cover the ascetic domain of hard training PA, such as weight training, or working out. We considered this involved the health-related fitness component of muscular strength.
Cathartic[1]	Q5. How do you feel about taking part in physical activities to move constantly and are very demanding on your body?	This targeted PA of vigorous intensity effort (PA ≥ 6 METS) in the Compendium of Energy Expenditure in Youth (CEEY; Ridley, Ainsworth, & Olds, 2008). We considered this involved the health related component of muscular endurance.
Fitness	Q6. How do you feel about taking part in physical activities to get your body in better condition?	This dimension, retained from Schutz et al.'s (1985) CATPA survey, was directed at moderate intensity effort (PA = 3.0 - 5.9 METS). We considered this involved the health-related fitness component cardio-respiratory endurance.
Aesthetic[1]	Q7. How do you feel about taking part in physical activities that have beautiful, flexible and graceful movements?	This CATPA question was adapted to include the health-related component of flexibility, and target activities such as yoga, aerobics, and dance activities.
Aerobic	Q8. How do you feel about taking part in slow steady physical activities where you do not get out of breath?	We designated this dimension as aerobic exercise and was added to cover PA of light intensity effort (PA ≤ 3 METS) in CEEY.

Note. Q = RPPA dimension question. [1]Kenyon's (1968) domains.

We applied the CATPA survey 5-point "smiley-face" format as we considered these universally age-appropriate and similar to emoji-based faces widely used on social media.

Schutz et al. (1985) identified that it was not possible to validate an inventory

with each domain represented by only one question. As the format of the RPPA questions converged with previously validated versions of the survey CATPA (Schutz et al., 1981; Schutz et al., 1985; Hagger et al., 1997), we examined the content and logical validity of whether Kenyon's (1968) dimensions were behaviorally relevant (Rhodes & Nigg, 2011) in light of current PA participation options. To determine content validity, we asked 15 undergraduate students to cite two different PA to represent each of the eight reasons to participate included in the RPPA survey. Using a construct validity ratio (CVR; Lawshe, 1975), we determined the students' response rate for the first cited PA for all eight questions of RPPA were CVR ≥ 0.86, $p \geq 0.001$. The response rate for the second cited PA for all eight questions of RPPA were CVR ≥ 0.60, $p \geq 0.01$. There was good content validity (Wilson et al., 2012) for both sets of citations and indicated that the students cited current and relevant PA for the eight reasons to participate.

For logical validity, we determined the behavioral relevance of the eight questions by examining the breadth of different PA cited, and the number of PA cited from the 16 options. The 15 undergraduate students cited 28 different PA with a median of 11 different PA per student. Analyzing only the first cited PA for the eight questions, four students cited eight different PA, six students cited one PA ≥ 2 times, and five students cited two or more PA ≥ 2 times. These data indicated the permutations of PA options for each question, which supported our contention of different permutations of RP from a single cited PA. The range of PA cited and the possibility for varying assignment of PA to Kenyon's dimensions supported both the behavioral relevancy of the dimensions, and PA as a generic term.

Activities of Daily Living Survey

The adolescents completed a 12-question survey covering self-reported PA, time involvement; rating of fitness perceptions; sedentary living and nutritional behaviors and knowledge. The questions were relevant and derived from a variety of sources covered within the FCS curriculum. As part of the demographic information of the survey, the adolescents self-reported height, weight (Strauss, 1999; Goodman et al., 2000), and date of birth.

Determination of grouping variables

The first grouping variable was a combination of weight status (WS) and perceived fitness (Fit). The WS measure was determined from the BMI percentile score of Barlow et al. (2007) and based on self-reported height, weight, and date of birth. Adolescents reported their perceived fitness (Fit) from the question: "How do you rate your fitness on a scale of 1 - 10?" The range was from one (*Extremely fit*) to 10 (*Not fit at all*). In development of the survey, we accepted Berkey et al.'s (2003) view that adolescents were mature enough to complete self-reported fitness perceptions in a PA survey. The multiplicative combination of the WS and Fit measures formed the WSFit variable for which scores ranged from 2.2 to 898.9. To determine WSFit groups, and with no pre-existing criteria for cut-offs to establish fitness performance relative to lifestyle, the decision was to divide the sample into three groups based on percentile divisions of WSFit.

The group sizes and cut-offs were Low-WSFit (Low-WS × High-Fit; n = 40; ≤ 228), Mid-WSFit (Mid-WS × Mid-Fit; n = 41; 229 - 466), and High-WSFit (High-WS × Low-Fit; n = 40; ≥ 467).

The second grouping variable was Effort-Involvement PA (EIPA). For the Effort (E) measure, adolescents reported their PA participation from the question "In the last 7 days, what kind of physical activities have you done outside of school?" We magnitude coded (Saldana, 2016) the PA participation responses for magnitude of effort using MET codes from the CEEY (see **Table 3**). If a participant response did not include a defined level of effort, such as "walk", we coded at the lowest MET level. Each adolescent's combined weekly total of energy expenditure effort was the sum of his or her coded PA MET levels. Adolescents reported involvement (I) time in PA in 10 min increments ranging from 0 - 60 min, from the question "How many minutes are YOU physically active each day?" The measures of E and I combined multiplicatively to form Effort-Involvement Physical Activity (EIPA) and the scores ranged from 29.0 to 1728.0. With no preexisting criteria for group determination of EIPA, we decided to multiply the CEEY effort expenditure cut-off levels of Light (≤ 2.99 MET); and Hard (≥ 6.00 MET) Effort by the maximum reported time value for I (60). The following group sizes and cut-offs for the EIPA groups resulted: Light-EIPA group (n = 53; ≤ 179); Moderate-EIPA group (n = 37; 180 - 359); and Hard-EIPA group (n = 79; ≥ 360).

2.3. Sample Size, Power and Precision

We performed an a priori statistical power analysis for the Chi-square test between the WSFit and BMI groups and with, df = 2, α = 0.05, β = 0.80, V (effect size; ES) = 0.30, required a sample of n = 108, indicating the sample size (n = 121) was more than adequate (G*Power 3.1.9.7; Faul et al., 2007). The a priori power analysis of the repeated measures MANOVA with three groups and eight repeated measures as the profile analysis with α = 0.05, β = 0.80, partial η^2 (ES) = 0.06 indicated a total sample size n = 153, which the EIPA sample exceeded. For the WSFit sample we conducted a sensitivity power analysis, for the sample n = 121, α = 0.05, β = 0.80, and the required ES was partial η^2 = 0.08 (G*Power 3.1.9.7). For the one-way ANOVA with α = 0.05, β = 0.80, partial η^2 = 0.06, the projected sample size was n = 159, as a result we conducted a sensitivity power analysis for the WSFit sample, n = 121, with α = 0.05, β = 0.80, the required ES was partial η^2 = 0.08 (G*Power 3.1.9.7).

2.4. Data Analysis

Multi-class administration of the surveys resulted in 16 children completing the surveys twice in different classes allowing intra-class correlations (ICC) as test-retest reliability for the following questions: "How many minutes are YOU physically active each day?" and "How do you rate your fitness on a scale of 1 - 10?" MacDonald's (1999) omega (ω) assessed the reliability of the survey, as there was no intention to reduce the variables to a composite unidimensional score.

Table 3. Coding of student cited physical activities according to the Compendium of Energy Expenditures for Youth (CEEY).

Cited PA (n = 173)	Citations[1] (N = 322)	% of PA Coded EE	CEEY Code	METS from CEEY
Low Effort (< 3 METS)		35.09		
Walk	92		240051	2.9
Play	9		341991	2.8
Work	5		733010	2.3
Catch	4		342771	2.0
Active video games	2		732201	1.7
Yoga	1		331630	2.5
Moderate Effort (3 - 6 METS)		21.74		
Weights	30		331963	3.5
Ride bike	19		341481	4.7
Volleyball	4		342692	4.0
Rollerblade	4		341311	4.9
Aerobics	3		341751	5.0
Play tag	3		342851	3.8
Kickball	2		342351	5.3
Walking Stairs	2		240071	5.3
Dancing	1		741260	3.2
Sweeping floor	1		641210	3.6
Ice skating	1		341301	5.5
Vigorous Effort (> 6 METS)		43.17		
Run	60		341481	7.7
Basketball	33		342032	8.2
Football	12		342151	6.6
Baseball	6		342023	6.3
Track	5		341483	9.3
Softball	5		342563	6.3
Soccer	4		342182	8.8
Swimming	3		341611	8.4
Trampoline	3		341681	6.5
Wrestling	3		341322	10.0
Boxing	3		341322	10.0
Dancing	1		341133	6.9
Move heavy furniture	1		641410	6.0
M PA/adolescent	1.86			

Note. [1]From question: "In the last 7 days, what kind of physical activities have you done outside of school?"

Accepting Kenyon's (1968) view that the dimensions "were not all on the same level of discourse" (p. 98) we followed the rationale of Dunn et al. (2014), who indicated that omega is preferable in experimental conditions where "equal sensitivity across all survey items is unrealistic" (p. 402). For the RPPA survey we calculated McDonald's ω for the WSFit sample (n = 121), and for the EIPA sample (n = 169) using JASP v.0.11.1 (JASP Team. University of Amsterdam, 2019). A two-way Chi-square analysis of independence determined the equality of distribution between the WSFit groups and BMI percentage groups (normal, overweight and obese; Barlow et al., 2007). As the attitudinal evaluations were from the same attitudinal scale, we examined the eight dimensions of RPPA in profile analysis choosing to use repeated measures MANOVA. With no a priori conceptual basis on which to order the questions for the profile, we used the order of questions presented in the survey. We conducted two separate profile analysis of the eight RPPA dimensions, one for the WSFit groups (Low-WSFit, Mid-WSFit, and High-WSFit), and one for the EIPA groups (Light-EIPA, Moderate-EIPA and Hard-EIPA). To determine EIPA behavior differences between WSFit groups we conducted a one-way ANOVA on EIPA × WSFit groups (Low-WSFit, Mid-WSFit, and High-WSFit). For these analyses, we used IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA).

3. Results

Accepting the multidimensionality of the scale the reliability of RPPA survey for WSFit groups (n = 121) was ω = 0.74, and for the EIPA groups (n =169) was ω = 0.80. The interpretation of both ω results showed average to good levels of reliability (Brown et al., 2009) for the RPPA survey. The ICC test-retest reliability for "How many minutes are you physically active each day?" ICC = 0.97 [0.91, 0.99] and "How do you rate your fitness of a scale of 1-10?" ICC = 0.93 [0.81, 0.98], was interpreted as good to excellent (Koo & Li, 2016).

To determine whether perceived fitness was an effective moderating factor on BMI percentage for group determination a two-way Chi-square test examined the equality of distribution between the three WSFit groups and three BMI groups (normal weight, overweight, and obese; Barlow et al., 2007). The result was $\chi^2(4) = 58.86$, $p < 0.001$, V = 0.28, indicating significant unequal distributions between these grouping variables. The distributions of BMI in the WSFit groups resulted in the entire Low-WSFit group were normal weight (n = 40); the Mid-WSFit group included adolescents who were normal weight (n = 29), overweight (n = 6) obese (n = 6); and the High-WSFit group included adolescents who were normal weight (n = 8), overweight (n = 9) and obese (n = 23). These unequal distributions supported WSFit as a viable and alternative lifestyle variable with which to determine adolescent groups.

The first hypothesis examined whether there were differences in profiles of evaluative responses on the RPPA survey between WSFit groups (Low-WSFit, Mid-WSFit, and High-WSFit). The expectation was that adolescents who differed on WSFit would have different evaluative profiles. Using the Wilk's Λ criterion,

the PRPA profiles for WSFit groups (see Figure 1) were parallel, $F(14, 320) = 1.62$, $p = 0.07$, partial $\eta^2 = 0.09$, and this was unexpected. The analysis of the levels test, from the between-subjects analysis, was significant $F(2, 118) = 5.73$, $p < 0.01$, partial $\eta^2 = 0.09$. The result for the test of flatness of the profiles, from the within-subjects analysis, was significant $F(7) = 26.35$, $p \leq 0.0001$, partial $\eta^2 = 0.18$. The ES, as determined by partial η^2, resulted in a medium ES for parallelism and levels, and a large ES for flatness (MRC Cognition and Brain Science Unit, 2007).

With significant effects only for levels and flatness specific contrasts on estimated marginal means identified the variability. The between groups contrasts on marginal means for levels resulted in a significant main effect $F(2, 118) = 6.83$, $p < 0.01$, partial $\eta^2 = 0.10$, with a significant pairwise comparison between Mid-WSFit vs. High-WSFit *M* Difference = 0.39, $p < 0.01$, [0.13, 0.65]. The multivariate test for flatness resulted in $F(7, 112) = 31.67$, $p < 0.0001$, partial $\eta^2 = 0.66$, with six of seven significant pairwise comparisons. These included Q1 vs. Q2, *M* difference = 0.60, $p < 0.0001$, [0.34, 0.85]. Q2 vs. Q3, *M* difference = 1.00, $p < 0.0001$, [0.74, 1.27]. Q3 vs. Q4, *M* difference = 0.37, $p < 0.0001$, [0.10, 0.64]. Q4 vs. Q5, *M* difference = 0.36, $p < 0.0001$, [0.07, 0.64]. Q5 vs. Q6, *M* difference = 1.01, $p < 0.0001$, [0.71, 1.31]. Q6 vs. Q7, *M* difference = 0.80, $p < 0.0001$, [0.44, 1.15].

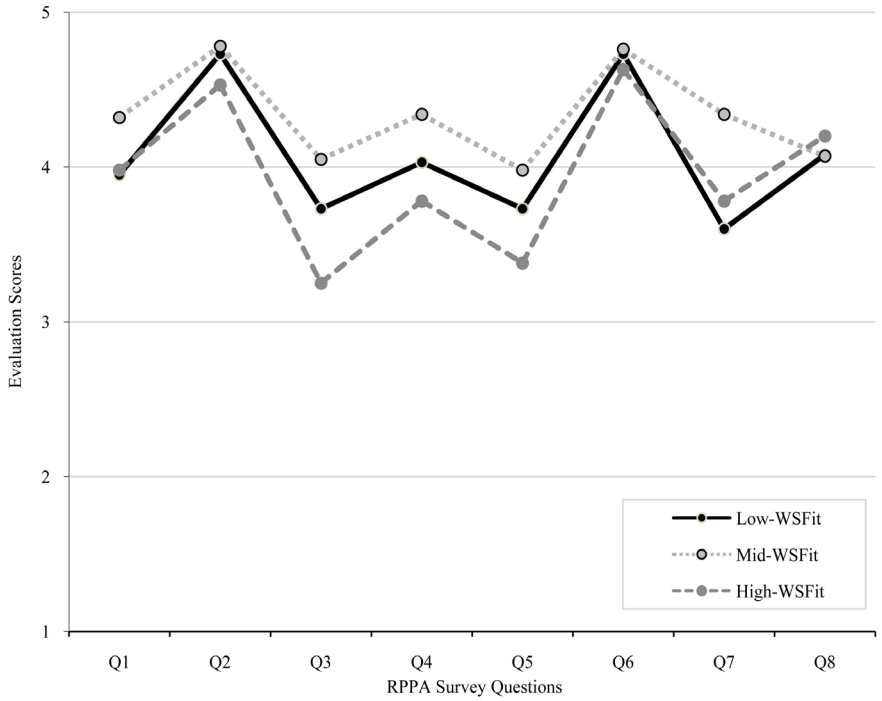

Figure 1. Profiles of RPPA Survey Questions for WSFit groups. All questions (Q) prefixed with "How do I feel about taking part in…" Q1 = "physical activities that provide a chance to meet new people?" Q2 = "physical activities to make you healthier or fitter?" Q3 = "physical activities to move very fast and must change direction quickly?" Q4 = "physical activities to be strong and fit?" Q5 = "physical activities to move constantly and are very demanding on your body?" Q6 = "physical activities to get your body in better condition?" Q7 = "physical activities that have beautiful, flexible and graceful movements?" Q8 = "slow steady physical activities where you do not get out of breath?"

As Figure 1 indicated there were possible differences between the WSFit groups for individual RPPA dimensions, we examined the simple effects and post hoc contrasts using separate one-way ANOVA for each dimension. Four RPPA dimensions, Q3, Q4, Q5 and Q7 resulted in significant group differences with significant post hoc contrasts between the Mid-WSFit and High-WSFit groups and between Mid-WSFit and Low-WSFit for Q7 (see Table 4). The simple effects for dimensions Q1, 2, 6, 8 were non-significant.

The second hypothesis examined whether there would be differences in profiles of evaluative responses on the RPPA survey between EIPA groups (Light-EIPA, Moderate-EIPA, and Hard-EIPA). The expectation was that adolescents who were more active would have more positive attitudinal evaluations towards RPPA than adolescents who were less active. The profiles for EIPA (see Figure 2) was significantly different from parallel $F(14, 320) = 2.55$, $p < 0.001$. $\eta^2 = 0.10$. The levels test resulted in significant group differences $F(2,166) = 9.53$, $p < 0.0001$, partial $\eta^2 = 0.10$. The test for flatness was significant $F(7, 160) = 35.28$, $p < 0.0001$, partial $\eta^2 = 0.16$. The ES were medium for the tests of parallelism and levels, and large for the flatness test (MRC Cognition and Brain Science Unit, 2007). The combination of significant parallelism, levels and flatness required within-subjects interaction contrasts to be completed and were significant for Q2 vs. Q3, $F(2) = 9.55$, $p < 0.001$, partial $\eta^2 = 0.10$, and for Q5 vs. Q6, $F(2) = 8.52$, $p \leq 0.001$, partial $\eta^2 = 0.09$. The other five interaction contrasts were non-significant. As Figure 2 indicated possible differences between the EIPA groups for individual RPPA dimensions, we examined the simple effects and contrasts using one-way ANOVA. Four RPPA dimensions, Q1, Q3, Q4, and Q5 resulted in significant post hoc contrasts between Hard-EIPA and Light-EIPA and between Hard-EIPA and Moderate-EIPA for Q4 and Q5 (see Table 4).

Table 4. One-way ANOVA for RPPA dimensions by WSFit and EIPA groups.

Group	RPPA dimension	Simple Effects		Post Hoc Contrasts			
				Groups 1 vs. 2		Groups 1 vs. 3	
		F test	partial η^2	*M* Difference	95% CI	*M* Difference	95% CI
		df = 2, 119					
	Q3	7.88***	0.12[a]	0.81***	[0.31, 1.30]		
WSFit	Q4	3.59*	0.06[a]	0.61**	[0.06, 1.16]		
	Q5	3.49*	0.06[a]	0.60*	[0.15, 1.05]		
	Q7	4.51**	0.07[a]	0.57**	[0.05, 1.08]	0.74***	[0.11, 1.37]
		df = 2, 167					
	Q1	8.34***	0.09[a]	0.63***	[0.26, 1.01]		
EIPA	Q3	18.61***	0.18[b]	0.96***	[0.58, 1.35]		
	Q4	12.02***	0.13[a]	0.48*	[0.07, 0.90]	0.91***	[0.54, 1.27]
	Q5	11.01***	0.12[a]	0.61*	[0.21, 1.02]	0.81***	[0.45, 1.16]

Note. * <0.05, ** <0.01, *** <0.001; [a]Medium effect size, [b]Large effect size (MRC Cognition and Brain Science Unit. (2007). WSFit Group 1 = Mid-WSFit; Group 2 = High-WSFit; Group 3 = Low-WSFit. EIPA Group 1 = Hard-EIPA; Group 2 = Light-EIPA; Group 3 = Moderate-EIPA.

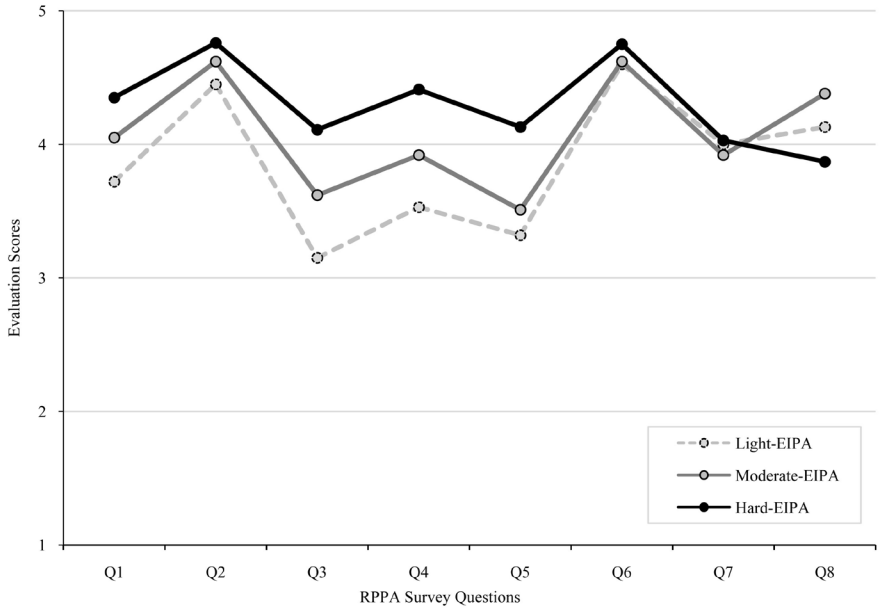

Figure 2. Profiles of RPPA Survey Questions for EIPA groups. All questions (Q) prefixed with "How do I feel about taking part in…" Q1 = "physical activities that provide a chance to meet new people?" Q2 = "physical activities to make you healthier or fitter?" Q3 = "physical activities to move very fast and must change direction quickly?" Q4 = "physical activities to be strong and fit?" Q5 = "physical activities to move constantly and are very demanding on your body?" Q6 = "physical activities to get your body in better condition?" Q7 = "physical activities that have beautiful, flexible and graceful movements?" Q8 = "slow steady physical activities where you do not get out of breath?"

The third hypothesis was that there would be mean differences between WSFit groups on EIPA, as a measure of PA behavior, with hierarchical differences from Low-WSFit to High-WSFit. The one-way ANOVA for WSFit groups (Low-WSFit n = 43, Mid-WSFit n = 41, and High-WSFit n = 42) resulted in statistically significant between-subject effects for WSFit, $F(2, 123) = 8.04$, $p = 0.001$, partial $\eta^2 = 0.12$. The ES was a moderate effect size (MRC Cognition and Brain Science Unit, 2007). The group means were not hierarchical, as the Mid-WSFit group reported the highest mean score for EIPA (M = 557.68, SD = 358.61). Post hoc multiple comparisons resulted in statistically significant mean differences between the Low-WSFit group (M = 258.28, SD = 215.52) and the other two groups: Mid-WSFit, M difference = 299.40, $p < 0.001$, [136.34, 462.23], $d = 0.60$; and the High-WSFit, M difference = 267.26, $p = 0.001$, [105.76, 429.33], $d = 1.12$. The two ES were medium and high (MRC Cognition and Brain Science Unit, 2007). Due to the large MOE for both comparisons (163.06 and 161.5 respectively), the precision of the 95% CI was questionable; however, the confidence intervals had little overlap, and indicated independent WSFit groups on EIPA.

4. Discussion

4.1. Evaluative Profiles

This study evaluated RPPA founded on alternative approaches of analyzing group

profiles, moderating weight-status groups, and effort-involvement PA groups. The first hypothesis resulted in significant profile differences in level and flatness across the eight RPPA dimensions for WSFit groups and indicated that there were group differences within and between dimensions in the profile. The lack of a significant parallelism result although approaching statistical significance was disappointing, however the effect size (partial $\eta^2 = 0.09$) was medium and showed a level of practical significance (Ellis, 2010). The deviation from levels was due to differences between High-WSFit and Mid-WSFit, which was not as expected. The deviation from flatness was evident for six of seven dimensional contrasts and we considered these within-subject interactions represented significant independence between these dimensions, and/or a possible lack of response set in answering the questions by the adolescents.

The simple effects and contrasts indicated both significant and non-significant separate one-way ANOVA results for the eight RPPA dimensions. Significant post hoc group contrasts between the Mid-WSFit and High-WSFit reported for RPPA dimensions Q3, Q4, Q5, and Q7, also between Mid-WSFit and Low-WSFit for Q7. These individual post hoc RP results identified where the at-risk High-WSFit group were less inclined to consider these participatory reasons relative to the other groups, suggesting these participatory reasons are potential targets for specific interventions. There were non-significant results for RPPA dimensions Q1, Q2, Q6, and Q8 that were similar to the results of other studies (Craeynest et al., 2005; Deforche et al., 2004; Kamtsios & Digelidis, 2008; Ickes & Sharma, 2012). We considered that the benefit of reporting and commenting on the non-significant results was that RPPA interventions could be targeted at all three groups concurrently, especially using PA that relate to the dimensions of "health and fitness" (Q2), and "constant and demanding movement" (Q6).

Examining the multidimensionality of Kenyon's (1968) model, the WSFit profile results provided more complexity and compatibility by which to analyze the relationship between RPPA and WSFit groups. What was unexpected was that there was not a hierarchical profile as the Mid-WSFit group reported higher RPPA mean scores than the other two groups (see **Figure 1**). This result was similar to the results of Kamtsios & Digelidis (2008) and Ickes & Sharma (2012). The lack of a hierarchical profile for the groups may be due to the use of equal tertiary cut-offs for the WSFit variable and/or the inclusion of perceived fitness as a moderator on BMI. However, in our study this was only an issue for the significant RPPA dimensions, which may have resonated more with the Mid-WSFit group. Based on these results, a question for future research is whether it is appropriate or necessary to expect hierarchical profiles on psychosocial determinants of PA, especially from groups that include lifestyle moderators on weight-status.

The results of the second hypothesis were significant parallelism, level, and flatness on the eight RPPA dimensions for EIPA groups. We developed EIPA as a grouping variable based on differences in past PA behavior following the lead of Schutz et al. (1981), and Hagger et al. (1997). The profile analysis resulted in

an expected hierarchical formation of RPPA. As a third of all PA reported by the adolescents were light PA we considered the development of EIPA to be more inclusive, personalized, and extended the range of PA analyzed for PR differences. There were significant post hoc comparisons between the High-EIPA group and the Light-EIPA group reported on RPPA dimensions Q1, Q3, Q4, and Q5, and between the High-EIPA and Moderate-EIPA groups on dimensions Q4 and Q5. We expected the dimensions of "agility" (Q3), "strength and fitness" (Q4), and "constant and vigorous movement" (Q5) to report EIPA group differences; but the results for the "meeting new friends" (Q1) dimension was unexpected as this is often a popular reason to participate in PA. Our expectation was that the Light-EIPA group, who participated in less intense PA such as walking, would use such PA to meet new friends, but it appears that this group either participates in Light-EIPA with their existing friends or family, or alone! As with the potential interventions for the WSFit groups, the dimensions of "health and fitness" (Q2), and "constant and demanding movement" (Q6) are highly valued participatory reasons for all three EIPA groups, and thus any PA that supports these dimensions would be good targets for interventions for all adolescents.

4.2. Physical Activity Behavior

The significant result for EIPA in the third hypothesis was similar to that of Kamtsios and Digelidis (2008), but differed from the results of Kopczynski et al. (2014), Deforche et al. (2004), and of Ickes and Sharma (2012). The expected hierarchy of WSFit groups on EIPA was not evident as the Mid-WSFit group reported the highest mean scores. To understand this we examined the differences in the components that contributed to the EIPA variable for the Mid-WSFit and Low-WSFit groups. The Mid-WSFit group reported higher group means than the Low-WSFit for effort (M = 11.35 vs. 10.42), minutes per day completing PA (min M = 46.51 vs. 44.80), and average of PA citations (M = 2.11 vs. 1.76). We considered these differences highlight the moderating effect of perceived fitness on BMI, and that there is a need to reflect lifestyle when examining PA behavior. The similarity between this PA behavioral result for the WSFit group and that of the first hypothesis on RPPA evaluations, suggests compatibility between the action-target combination of RP and PA. It also suggests that these adolescents are using their current PA behavior when identifying their RP, and is similar to the results of Schutz et al. (1981), and Hagger et al. (1997).

4.3. Practical Implications of Increasing PA Opportunities and Benefits

The results of this study have practical implications for increasing PA opportunities for adolescents identified as Light-EIPA and High-WSFit, and who are the most challenged by PAGA (DHHS, 2008) guidelines. A practical implication from this study was that the inclusive development of EIPA provides a much broader picture of PA participation than highlighted by MVPA. The results of

the analysis of EIPA support the continued inclusion of light PA in trying to understand how to increase PA not only for health, but also for other participatory reasons (Craeynest et al., 2005). However, the light PA cited by the children in **Table 3** raises two further implications. The first implication was that many PA were unstructured and could be easily self-regulated or avoided in terms of effort-involvement. The second implication relates to the evidence that walking accounted for 31.2% of the all cited PA, was the only PA cited by 28% of the sample, and by 67% of the High-WSFit group. We accept that these high citation levels may have occurred as walking was part of the curriculum of their FCS classes at the time of data collection. However, these levels of walking align with the results of Song et al. (2015), although in their study walking was one of an average of six cited PA undertaken in the last 7 days, which was far higher than the average of 1.81 cited PA by our sample. Even with adjustments within the CEEY (Sasaki et al., 2016) the effort-involvement implications must be that walking is not a panacea to achieving health benefits. For low active participants walking is only a first step to more effort and increased involvement in PA (Berkey et al., 2003). Determining how adolescents progress from walking, and other low effort EIPA, to higher effort-intensity PA is an important area for future research.

Another practical implication relates to the inclusion of a lifestyle moderator on BMI. This approach has implications for physical educators and other PA professionals, as they must reconsider who is at-risk by being in the High-WSFit group. The composition of this adolescent group, including those identified as normal, overweight and obese, provides a very different perspective on who needs assistance for health and other benefits of PA, especially given their significantly lower self-reported levels PA behavior. The results of the WSFit profile analysis for at-risk groups identified the evaluatory importance of specific RPPA dimensions to increase PA behavior, but also identified common RPPA dimensions that can be of importance for all adolescents. Determining the effectiveness of such RPPA interventions is an area for future research.

We claim there are practical implications of applying the multidimensional approach of the RPPA survey, as adolescents can realize their PA opportunities through specific reasons to participate. However, we can only partially make this claim, as the 173 adolescents reported 118 different permutations, from a possible 392,625 RPPA permutations for this eight-question survey. We have yet to determine how to explore the extent of these permutations, but this would suggest that the profile analysis is only scratching the surface of how to examine reasons to participate. One future direction may be to develop individualized surveys based on relevant RP and directly cited PA to generate evaluative responses that can lead to increasing PA opportunities.

4.4. Limitations, Strengths and Further Developments

Given the alternative approaches to this study, there are limitations. The use of 5-point Likert-type smiley faces was a limitation by generating only one evaluative response per dimension. However, we considered that the "smiley-faces" are

compatible with the question prefix "how do you feel about…" used in our survey, additionally we used smiley-faces to expedite the time completing this survey in the data collection that included other surveys. A pre-set order of survey questions was a limitation when using profile analysis as the analysis of levels was effectively determining difference based on the random placement of questions in the survey. Further research needs to consider the significant independence between RP dimensions, and/or whether this was a lack of response set by the adolescents when answering the questions.

Self-reporting of perceived fitness, height and weight, and time (min) participating in PA were potential limitations in terms of the accurate representation of these variables. We are aware that direct measures of these variables would be more acceptable, however this was not feasible in this study due to time and support limitations. However, within the biannual YRBS surveys, self-reporting is well established, and adolescents have been considered mature enough to complete self-reported weight status (Strauss, 1999; Goodman et al., 2000) and fitness measures (Berkey et al., 2003).

Limitations related to the development of EIPA included the coding from CEEY to determine effort of PA. In reporting their PA in the last 7-days, adolescents often provided very simple versions of many PA, such as "walk", which resulted in our coding decision to assign any PA cited without any identified qualification at the lowest level of energy expenditure. More specific protocol instructions may be necessary to collect more accurate self-reported PA. A limitation of survey question "How many minutes per day do you do PA" was that the responses were designed with only increments of duration less than and equal to the 60 min MVPA threshold. This provided a ceiling to the upper range of involvement time, although we did not consider this problematic given the wide range of EIPA scores. The reporting of sub-60 min PA diverged considerably from increments for duration of time in PA that extended considerably beyond the 60 min threshold (Olds et al., 2011; Berkey et al., 2003; Ickes & Sharma, 2012). However, the emergence of Light PA reinforced appropriateness of the increments used as we expected lower reporting time than 60 min by the at-risk groups. The results of this study would suggest as a further development that YRBS should consider reinstating the PA questions, used prior to 2011, which included increments below 60 min and of low intensity (Youth Risk Behavior Surveillance System, 2018).

The highly positive RPPA scores for the High-WSFit and Light-EIPA groups, was a limitation, even though such highly positive have been a consistent pattern within numerous attitudinal studies (Deforche et al., 2004; Hagger et al., 1997; Ickes & Sharma, 2012; Kamtsios & Digelidis, 2008; Schutz et al., 1981). This raises two important questions for further RP studies. The first question is how positive does RPPA need to be to initiate increases in PA participation, especially considering that lower behavioral EIPA measures were evident. The second question is how and when are RPPA formed by adolescents as this may be the key to effective future PA interventions.

5. Conclusion

This study was able to discern participatory reasoning differences for WSFit groups, and the results indicated that RPPA provided parallel, but non-hierarchical profiles across WSFit groups, and that there were significant differences in levels and flatness. Based on the effectiveness of WSFit we recommend that moderating variables be employed with BMI in future analysis, especially when analyzing lifestyle determinants of PA of adolescents. The RPPA profile for EIPA groups showed a non-parallel profile with significant differences in levels and flatness. Analyses of separate RP dimensions indicated that there were sets of significant and non-significant RPPA results for both WSFit and EIPA groups that would be relevant in developing multiple alternative intervention strategies to assist adolescents realize their opportunities to become more physically active. Using EIPA to examine behavioral differences in WSFit groups resulted in significant and non-hierarchical group differences that mirrored the RPPA profile and established a compatibility between attitude and behavior measures that can be beneficial in increasing PA behavior. This study applied alternative approaches to defining and analyzing at-risk groups who find recommended daily levels of PA challenging. We reported group and dimension differences on RPPA survey that can encourage and assist adolescents grouped as either Light-EIPA and/or High-WSFit to realize their opportunities and commit to becoming more physically active not just for health benefits, but for a broader range of other reasons to participate as well.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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