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The development and validation of the pictorial motivation scale in physical activity

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Abstract The purpose of the present research was to report the validation of the pictorial motivation scale in English. This scale is designed for adolescents and adults with an intellectual disability who are unable to independently read a questionnaire. The scale has a picture and phrase depicting 16 items related to participation in sport and physical activity; four for each of the following subscales, intrinsic motivation, self-determined extrinsic motivation, non self-determined extrinsic motivation, and amotivation. Phase 1 of the research describes the formal translation of the scale from French to English. Results from three studies conducted with Special Olympians (Phase 2) and adolescents in a special school (Phases 3 and 4) provided support for the internal consistency, test–retest reliability, and factorial and construct validity of the scale. Overall, the scale would appear to be sufficiently reliable and valid to warrant its continued use and further development.

Keywords Motivation · Validation · Intellectual disability · Self-determination

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Introduction

A desirable objective of physical activity programs for people with an intellectual disability is the nurturing of intrinsically motivated behaviors that will guide individuals throughout their lives (Vallerand and Reid 1990; Wehmeyer 2001). Frequently, extrinsic means are used to motivate them to act (Cohen 1986; Caouette and Reid 1991), the consequence in the physical activity domain being a decrease in spontaneous activity (see reviews by Vallerand et al. 1987; Vallerand 2001). Individual differences in the amount of physical activity notwithstanding, adolescents and adults with intellectual disabilities often have sedentary lifestyles (Frey et al. 2008; Hoge and Dattilo 1995; Temple et al. 2006). With regard to general development of those with an intellectual disability Switzky (2001, p. 57) has argued that "Personality and motivational self-system processes are the energizing forces that drive all other psychological, learning, or self-regulatory processes underpinning the performance of persons with mental retardation". He hypothesized that children with intellectual disabilities meet with frequent failure in daily activities and that intrinsically oriented exploratory or problem solving behaviors become less frequent with development. With less social feedback for successful behaviors from parents and other socializing agents, an extrinsic motivation orientation emerges. Arguably, an extrinsically motivated person becomes dependent upon external reinforcement (Bybee and Zigler 1999; Cohen 1986; Switzky 2001) and less inclined to participate in physical activity (Vallerand and Reid 1990).

Studying motivation in the physical activity and sport context of those with intellectual disabilities should increase our understanding of the psychological processes underlying participation, and assist in designing effective

intervention. The assessment of the physical activity motivation of individuals with an intellectual disability would represent an important step for motivation research. To that end, the present research reports the modifications and further validation of the pictorial motivation scale (PMS) in sport and physical activity. Poulin (1992) constructed the first version of the PMS specifically for adolescents with an intellectual disability. It had a picture depicting each of the 20 questions, five for each of the four subscales: intrinsic motivation, self-determined extrinsic motivation, non-self-determined extrinsic motivation, and amotivation (defined below). The pictures were conceived as an important means to overcome reading difficulties and to present concepts such as intrinsic motivation in an accessible manner for this population. Sixty-two high school students with an intellectual disability completed the PMS and several scales thought to assess motivational antecedents and outcomes.

The results provided preliminary support for the psychometric integrity of the scale. Internal consistency (Cronbach's alpha) and temporal stability were sufficiently high to conclude that the scale was a reliable instrument (average $\alpha = .74$; range = .53–.85 and average test–retest = .83; range = .61–.94). As predicted by self-determination theory (Deci and Ryan 1985; Vallerand 1997) there was support for a simplex pattern of correlations among the subscales where adjacent subscales were more closely related than non-adjacent subscales. That is, intrinsic motivation and self-determined extrinsic motivation were positively correlated ($r = .47$) while intrinsic motivation and amotivation were negatively correlated ($r = -.21$). One of the problems of the scale was that the amotivational subscale had marginal reliability ($\alpha = .53$). Consequently changes in this subscale seemed warranted. Also, a replication of reliability and validity of the overall scale would enhance its psychometric properties. Finally, since the original research was conducted with French-speaking adolescents, a formal validation of the scale into English would increase its availability.

The theoretical orientation for the present version of the PMS is the hierarchical model of intrinsic and extrinsic motivation developed by Vallerand et al. (Vallerand 1997, 2001, 2007; Vallerand and Perreault 1999). In line with self-determination theory (Deci and Ryan 1985, 2000), the first element of the hierarchical model includes the constructs of intrinsic motivation, extrinsic motivation, and amotivation which play a crucial role in understanding the psychological processes underlying behaviors inside and outside sport and physical activity (e.g., Deci and Ryan 1985; Frederick and Ryan 1995; Vallerand 1997; Vallerand et al. 1987; Vallerand and Reid 1990). A second element is that intrinsic and extrinsic motivation and amotivation exist at three hierarchical levels of generality. The lowest level is the situational or state level whereby variables such as current feedback and rewards from a coach or teacher influence motivation. The second level of generality is the contextual or life domain. At this level it is proposed that individuals possess relatively stable motivations toward specific life contexts such as education, interpersonal relationships, and sport. The motivational scale described in this study is aimed at validating a scale to assess contextual motivation toward sport and physical activity in persons who have an intellectual disability. The contextual level was selected because they are quite stable tendencies, but also sensitive to social influences (e.g., parents and teachers) which may form part of intervention strategies in future research. The third level of the hierarchical model is akin to a personality trait and is termed the global level.

A third element of the model refers to the social determinants of motivation. The impact of the social factors is mediated by perceptions of competence, autonomy, and relatedness. Thus, coaches will influence their athletes' motivation only to the extent that they affect the athletes' perceptions of competence, autonomy, and relatedness. The last element of the model is that important outcomes result from motivation. These motivational consequences can be cognitive, affective, and behavioral in nature. Thus, positive consequences, such as persistence in an activity when facing a difficult challenge, will usually be produced by intrinsic motivation, whereas negative consequences such as withdrawal from activity will typically be engendered by amotivation and certain types of extrinsic motivation, to be described below.

Vallerand's (1997, 2001, 2007) hierarchical model derives from self-determination theory (SDT) of Deci and Ryan (1985, 1991). These latter researchers were the first to argue that any theoretical account of motivation must consider intrinsic motivation, extrinsic motivation, and amotivation. According to Deci (1971), intrinsically motivated behaviors are those that are engaged in for the pleasure and satisfaction derived from participating in the activity. They are activities that people voluntarily perform in the absence of material rewards or constraints. Moreover, intrinsic motivation is based on the psychological need to feel competent and self-determining in dealing with one's environment.

Extrinsic motivation explains a wide variety of behaviors engaged in as means to an end and not for their own sake. Deci and Ryan (1985) and Vallerand (1997) propose four types of extrinsic motivation regulation; integrated, identified, introjected and external. We were concerned with the ability of our target population to distinguish among the four and wanted to keep the questionnaire as short as possible, therefore we divided extrinsic motivation into two broad types, self-determined and non-self-determined. Self-determined extrinsic motivation (integrated

and identified regulations) is at play when behavior is valued and chosen by the individual and is part of the self, for example choosing to participate in physical activity because keeping in shape is a personal value. Non-self-determined extrinsic motivation (introjected and external regulations) exists when participation is driven by reason of guilt or controlled by external constraints and rewards.

Amotivation is present when an individual does not perceive contingencies between outcomes and actions. There is an experience of incompetence and lack of control. Amotivated behaviors are neither intrinsically nor extrinsically motivated: they are nonmotivated. These definitions of amotivation, non self-determined extrinsic motivation, self-determined extrinsic motivation and intrinsic motivation represent preoperational explications, an early step in the construct validation process (Bryant 2000).

In light of the importance for research to assess the motivation of individuals with an intellectual disability, the purpose of the present research was to translate and validate the PMS in English. Specifically, the objectives of the present research were to (1) modify the amotivation subscale, (2) translate the scale from French to English, and (3) further assess the reliability and construct and factorial validity of the PMS. The scale was based on contextual motivation because we wanted it to be at the same level of generality as the Sport Motivation Scale (Pelletier et al. 1995a) and to enable teachers and researchers to assess students' usual level of motivation toward physical activity, rather than motivation in specific situations. There were four phases of the research. In Phase 1, new items for the scale were created and the scale was translated into English. In Phase 2 the PMS was completed by English-speaking Special Olympians in order to assess its internal consistency, factorial validity (a form of content validity), and construct validity. Construct validity has two forms, convergent and discriminative (Bryant 2000), and was determined by looking for the simplex pattern of correlations among the subscales. Since SDT (Deci and Ryan 2000) conceptualizes the four types of motivation to fall along a line of self-determination; one would expect correlations to be positive and higher between adjacent types (e.g., amotivation and non self-determined extrinsic motivation) and negative or low between distant types. Convergent validity is the case when measures of a construct are positively correlated while discriminative validity comes into play when different constructs are not expected to be correlated (Bryant 2000). The simplex pattern has aspects of both convergent and discriminative validity and thus we refer to construct validity to encompass both types when referring to the simplex pattern of correlations. Phase 3 included a new sample of adolescents and we assessed the internal consistency, test–retest reliability, and both construct and concurrent validity of the scale. We tested again for the presence of the simplex pattern of correlations among the PMS subscales as evidence of construct validity and assessed the pattern of relationships between the PMS subscales and some variables known as motivational antecedents (e.g., perceived competence) and outcomes (e.g., expended effort) as evidence of concurrent validity. In Phase 4 the scale was re-administered to some of the original Phase-3 participants, but this time without the pictures, to determine if the pictures were in fact facilitating the understanding of the scale items. If the pictures are important, their absence should lead to low reliability estimates of the PMS subscales.

Phase 1

The purpose of Phase 1 was to refine and translate in English the original French version of the PMS (Poulin 1992). A panel of five experts in motivation was established to review the scale developed by Poulin (1992), in particular the amotivational subscale. These experts held the doctorate degree and were members of a motivation and social psychology research laboratory. The purpose of this evaluation was to enhance the content validity of the amotivation subscale and to reaffirm that the intrinsic motivation and self-determined and non-self-determined extrinsic motivation subscales were consistent with recent formulations of SDT. Six new questions were generated for the amotivation subscale and one each for the remaining three subscales. The artwork for the pictures was commissioned, reviewed, and finalized for six questions each of intrinsic motivation, self-determined extrinsic motivation, non-self-determined extrinsic motivation, and 10 for amotivation. The artist was requested to depict people without a specific gender and in a cartoon-like fashion. Four of the pictures and accompanying statements are found in Fig. 1. A score of 3 was assigned if the individual selected "like me", 2 for "a little bit like me", and 1 for "not like me".

The PMS was then translated according to the first four procedures of the back translation process outlined by Vallerand and Halliwell (1983) and Vallerand (1989). First, the back translation procedure was conducted on two occasions. Thus, the original French PMS was translated into English by a social psychologist cognizant of SDT and that translation was re-translated into French by another (and different) social psychologist. This process was repeated with two other social psychologists. The second step consisted of a committee of six bilingual motivational experts to assess the translation and agree upon the most appropriate English version. Following item preparation, a trained research assistant administered the PMS to

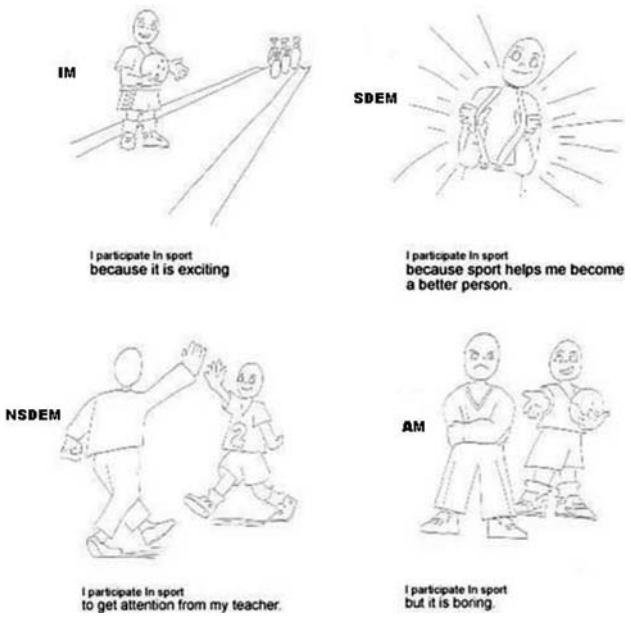

Fig. 1 Selected items from the pictorial motivation scale. *IM* intrinsic motivation; *SDEM* self-determined extrinsic motivation; *NSDEM* non self-determined extrinsic motivation; *AM* amotivation

adolescents with an intellectual disability on an individual basis according to procedures outlined in a manual written by the original developers. These interviews revealed that some items were more easily understood than others and four items were selected for each of the subscales. The final set of items for the four subscales that emerged and which are used in the present series of studies are presented in Table 1. A sample picture for one item from each scale appears in the Fig. 1.

Phase 2

The specific purposes of Phase 2 were to assess the internal consistency of the PMS and its factorial and construct validity. We expected a 4-factor structure consistent with our four subscales of motivation, adequate internal consistency, and support for the simplex pattern of correlations among the four subscales.

Method

Participants

Participants were 160 (92 male, 68 female) athletes in Special Olympic programs throughout British Columbia. These athletes were recruited from programs in Vancouver, North Vancouver, Surrey, Burnaby, Nanimo, Kelowna, Vernon, and Quesnel. Special Olympics is an international program of physical activity and sport competition designed for individuals who are deemed to have an intellectual disability by local authorities. All 160 athletes were Special Olympians at the time of data collection, although IQ scores were not released to the researchers. The mean age was 31 years (SD = 10.9, range = 15–66).

Table 1 Descriptive statistics and factor loadings for the PMS items: Phase 2

	Mean	SD	Skewness	Kurtosis	Loadings
I participate in sport…					
But I am not sure if it's worth it (AM1)	1.50	.76	1.12	−.32	.39
But It is boring (AM2)	1.31	.62	1.86	2.14	.65
But I am wasting my time (AM3)	1.32	.66	1.81	1.72	.62
But I donot really know why (AM4)	1.35	.66	1.66	1.33	.63
To please my coach or someone else (NSDEM1)	2.51	.75	−1.16	−.22	.48
To get attention from my coach (NSDEM 2)	2.21	.91	−.42	−1.67	.58
To be popular with my friends (NSDEM 3)	2.40	.86	−.87	−1.08	.77
To show others I am good at sports (NSDEM 4)	2.74	.61	−2.17	3.19	.64
Because it is a good way to learn things which can be useful in life (SDEM1)	2.79	.50	−2.44	5.14	.40
Because sport is a part of me (SDEM 2)	2.90	.35	−3.84	15.06	.44
Because it is a good way to meet people (SDEM 3)	2.94	.29	−5.07	27.23	.36
Because sport helps me become a better person (SDEM 4)	2.80	.52	−2.59	5.66	.65
Because it is fun (IM1)	2.89	.40	−3.76	13.69	.44
Because it is exciting (IM2)	2.94	.29	−5.07	27.23	.41
Because it is interesting (IM3)	2.89	.39	−3.91	14.83	.60
Because sport is great (IM4)	2.76	.60	−2.36	3.96	.73

Note: Factor loadings are those of the items on their respective factors

Procedures

A trained research assistant administered the PMS to participants on a one-to-one basis in a quiet location near their training site. Several steps were taken to ensure that scale items were understood by participants. First, the experimenter asked "practice questions" unrelated to motivation dealing with watching TV after school and the listening often to the radio. Second, as each picture was shown the experimenter read the accompanying statement at the bottom of the picture. The responses of 'like me', 'a little bit like me', and 'not like me' were printed in large letters on three separate cards. The adolescent could respond by saying the phrase or pointing to one of the cards. Finally, participants were allowed several seconds to respond. The phrase was repeated if the participant did not respond or if he/she asked for a repetition. Scale completion took on average 20 min.

Results

Analyses

Confirmatory factor analysis using EQS (Bentler 1995) employing maximum likelihood procedures were used to evaluate the fit of the four factor oblique PMS model to the data. Chou and Bentler (1995) recommend consideration of the Satorra-Bentler SCALED statistic, based on a correction to the ML χ^2 statistic, when the multivariate normality assumption is under threat. For the measurement model analyses, items were uniquely loaded on appropriate factors, the variance of each latent factor was fixed at 1.0 for identification purposes, factors were allowed to correlate, and uniquenesses were not allowed to correlate. A variety of fit indexes are reported for the measurement analysis conducted in the investigation including the Incremental Fit Index (IFI), the Goodness of Fit index (GFI), the Comparative Fit Index (CFI), and the Root Mean Squared Error of Approximation (RMSEA) (Bentler 1995; Hoyle and Panter 1995).

Descriptive statistics and data distributional properties

PMS item and scale descriptive statistics for the total sample are presented in Table 1. The internal consistency measures (Cronbach alphas) were: .61 (intrinsic motivation), .60 (identified regulation), .71 (external regulation), and .65 (amotivation). These values, while not high, were still acceptable considering that they are based on 4-item subscales.

Examination of the data revealed high univariate skewness and kurtosis grand mean values and item mean ranges. Notable multivariate kurtosis among variable sets was indicated by Mardia's coefficient (50.50). Multivariate nonnormality can be managed by conducting analyses based upon ML estimator analyses using the SB scaled statistic.

Confirmatory factor analyses

Global indices of fit suggest the four factor oblique PMS model provides a good fit across all indices for the data. The robust chi-square = 97.30, $p > .50$, robust CFI = .99, IFI = .90, and RMSEA = .053. The distribution of the standardized residuals reinforces the positive assessment of model adequacy in this sample by revealing minimal evidence of significant over- or underestimation of fitted correlations (90.76% $z < |.1|$, .74% $z > |.2|$). Also supporting the fit of this model were the significant ($p < .05$) loadings for all items on the appropriate factors (Table 1). There was no evidence of significant cross-loadings of items on other factors. The present data thus provide factorial validity for the PMS.

Construct validity

In addition to assessment of factorial validity, Phase 2 also assessed construct validity of the PMS by testing for the presence of a simplex pattern of correlations among the PMS subscales. Li and Harmer (1996) examined the simplex structure by specifying causal pathways between adjunct types of motivational regulation and examining direct and indirect effects. However, as Markland and Tobin (2004) noted, this approach is not theoretically justified because each type of regulation does not cause a more self-determined form of motivation, rather, "the theory carries the less stringent assumption that the constructs are intercorrelated in a [simplex] pattern" (p. 195). The intercorrelations among latent variables from the CFA output provide support for the simplex pattern. Specifically, correlations among adjacent constructs are always stronger than those between non-adjacent ones, see Table 2.

Phase 3

There were several purposes to Phase 3. The major purpose was to further assess the construct validity of the PMS by replicating the findings of Phase 2 with respect to the simplex pattern of correlations among the PMS subscales. Second, we assessed concurrent validity by correlations between the PMS subscales and variables previously found to be antecedents and outcomes. Thus, perceptions of competence, known to represent a key motivational antecedent (e.g., Vallerand and Reid 1984), as measured by

Table 2 Correlations among the PMS subscales in Phase 2

	IM	SDEM	NSDEM	AM
Intrinsic motivation (IM)	–	.49	.17	−.44
Self-determined extrinsic motivation (SDEM)		–	.37	−.35
Non self-determined extrinsic motivation (NSDEM)	–	–	–	.27
Amotivation (AM)	–	–	–	–

Note: All correlations are significant at $p < .05$

both the participants and their physical education teachers, were measured in Phase 3. We expected positive and significant correlations between the PMS and scales assessing perceived competence, and negative correlations between perceptions of competence and both non-self-determined extrinsic motivation and amotivation. Teachers were also asked to assess the effort expenditure of their students in the physical education classes. It was hypothesized that students who are intrinsically motivated and who engage in sport and physical activity out of choice (self-determined extrinsic motivation) should expend considerable effort while those who display higher levels of non-self-determined extrinsic motivation and amotivation should display less effort. A second major goal of Phase 2 was to assess the test–retest reliability of the PMS over a 3-week period. Because the PMS represents a motivational variable at the intermediate, contextual level (Vallerand 1997), moderate test–retest correlations (in the .55–75 range) were expected. Finally, we re-assessed the internal consistency (Cronbach alphas) of the PMS subscales.

Method

Participants

Eighty high school aged adolescents (13–18 years) who returned informed consent documents participated. Approximately 230 potential participants had received the forms.[1] There were 4 groups; 18 males, aged 13–15 years; 26 females, aged 13–15 years; 22 males, aged 16–19 years and; 14 females, aged 16–19 years. All participants attended a special high school for youngsters with learning problems, most having a mild intellectual disability. Access to student files was not possible; therefore it was impossible to verify the diagnosis of intellectual disability. Typically, these teenagers are first identified in regular elementary schools as they fall behind their peers academically, which leads to testing and evaluation to determine the extent and nature of the problem. For the students participating in this study, the learning difficulties[2] were considered severe enough to warrant special school placement during the high school years. Learning difficulties do suggest problems in functional areas like reading, math, and science. However, it would be unethical to state that all participants had an intellectual disability because we could not formally confirm the diagnosis. Yet, these young adolescents remained appropriate candidates for a pictorial motivation scale because of their limited reading ability and their attendance at a school for learners with an intellectual disability.

Teachers in the school were asked if the designated students understood the concepts, "like me", "a little bit like me", and "not like me", which was necessary to answer the PMS. Students who did not understand these concepts were replaced by others who returned their informed consent documents. This occurred in only two cases.

Instruments

Participants completed the PMS in Phase 3. As well, three additional instruments were used in the convergent validation process of the PMS: the pictorial perceived physical competence scale developed by Ulrich and Collier (1990), and two physical education teacher rating scales, one for physical skill and another for physical effort. Ulrich and Collier (1990) extended the pictorial scale of perceived competence and acceptance for young children (Harter and Pike 1981) so that it would include a more complete representation of the fundamental gross motor skill domain. It is a 10-item scale normed on children aged 7–12 years who had a mild intellectual disability, average IQ of 62.4. Coefficient alpha for the total scale was .82 and test–retest correlation for the mean scale score was .77. The structured alternative format of Harter (1982) was maintained by Ulrich and Collier. Specifically, two pictures are presented simultaneously, one representing a child who was 'pretty good' at the skill and the other depicting a child who was

[1] There are a number of reasons why potential participants did not return informed consent documents. Some may simply have exercised their right not to participate perhaps because expectations were not clear despite our best efforts. Others may have forgotten to take the documents home, or lost them within a backpack. We did not ascertain the reasons and do not know if the sample of 80 was different from the 230 in an important way in the context of this research.

[2] These participants attended a special high school designed for those with an intellectual disability. We use the term "learning difficulties" for reasons indicated in the text, but this should not be confused with learning disabilities, a term which refers to a specific category of individuals in special education, very different from those who participated in the current study.

'not very good'. Participants select which of the two pictures he/she feels most like, and then decides if the child in the picture is a 'a lot' or 'a little' like themselves. The internal consistency (alpha) value in the present study was .76.

The male physical educator in the school taught the boys, while the female teacher taught the girls. Both teachers had been at the school for at least 7 years, therefore had considerable experience with the participants. Thus, the physical educator's rating scales were completed by these teachers for their respective students. The teachers were simply asked to rate each of the participants for physical skill and effort on a 20-point scale. A score of 20 was designated as high on both variables and 1 was very low. There were requested to rate individual students with similar age and sex classmates as the comparison group.

Procedure

The PMS was administered twice, approximately 3 weeks apart. Every attempt was made to re-test individuals at the identical time on the same day of the week. This was not possible in all cases due to scheduling constraints in the school. All participating students were removed from their class and accompanied to a small office, which served as the testing area for the graduate student who administered all tests individually. Each session lasted approximately 20 min.

The experimenter assisted in the physical education program for 3 weeks, prior to administering any scale, so that the students in the school could become accustomed to her. During the first meeting, the 80 participants completed the PMS. Three weeks later, PMS was completed again in addition to the scale from Ulrich and Collier (1990). Six participants were absent due to illness or participation in an employment program outside the school. Teacher ratings of skill and effort for each of the participants were collected at that point.

Ensuring that participants understood the questions and pictures of the PMS was enhanced in several ways. First, as noted, teachers were consulted and believed that each student understood the concepts 'like me', 'a little bit like me', and 'not like me'. The two students who seemed to have difficulties when the scale was actually administered were replaced. Second, there were two practice trials with pictures and statements. One practice trial asked about watching TV after school and the second about listening to the radio. Third, as each picture was shown, the experimenter read the accompanying statement at the bottom of the picture. The responses of 'like me', 'a little bit like me', and 'not like me' were printed in large letters on three separate cards. The adolescent could respond by saying the phrase or pointing to one of the cards. Fourth, participants were allowed several seconds to respond. The phrase was repeated if the participant did not respond or if he/she asked for a repetition. In a very few instances, the experimenter rephrased the statement in a minor way if she felt understanding would be enhanced for that particular participant.

Results

Means, internal consistency and temporal stability

The means and standard deviations of all study variables as well as internal consistency and temporal stability appear in Table 3. It is informative to note that the internal consistency values at time 1 ranged from .64 to .74. The alpha values were consistently higher at Time 2 with a mean alpha value of .84. Finally, the test–retest correlations were acceptable (mean $r = .70$) although the amotivational subscale had a somewhat low but acceptable retest correlation ($r = .57$).

Construct and concurrent validity

Since the internal consistency scores were higher at Time 2, validity correlations used Time 2 PMS responses. First, the simplex pattern was calculated and the results are shown in Table 4. As can be seen, the simplex pattern was generally upheld. For example, a higher correlation between IM and self-determined extrinsic motivation ($r = .63$) was found than between IM and non self-determined extrinsic motivation ($r = .17$). In addition, the correlation between IM and AM was $-.54$.

The concurrent validity of the PMS construct validity entailed assessing the correlations between the PMS subscales and the scales assessing antecedents (skill and

Table 3 Mean, standard deviation, internal consistency (Cronbach's α) at Times 1 and 2, and test–retest correlations: Phase 3

	Time 1			Time 2			Test–retest
	Mean	SD	α	Mean	SD	α	*r*
Intrinsic motivation (IM)	2.81	.33	.67	2.80	.40	.82	.74
Self-determined extrinsic motivation (SDEM)	2.12	.45	.64	2.50	.63	.84	.72
Non self-determined extrinsic motivation (NSDEM)	1.70	.65	.72	1.73	.73	.84	.78
Amotivation (AM)	1.35	.48	.74	1.39	1.39	.88	.57

Table 4 Correlations among the PMS subscales at Time 2 ($n = 74$): Phase 3

	IM	SDEM	NSDEM	AM
Intrinsic motivation (IM)	–	.63	.17*	−.54
Self-determined extrinsic motivation (SDEM)		–	.37	−.36
Non self-determined extrinsic motivation (NSDEM)	–	–	–	.03*
Amotivation (AM)	–	–	–	–

Note: All correlations are significant at $p < .01$, except those with an asterisk

Table 5 Correlations between the pictorial motivation subscales and other constructs: Phase 3

	Perceived physical competence		
	Self-ratings of competence	Teacher ratings of skill	Teacher of effort
Intrinsic motivation (IM)	.26* (74)	.28* (73)	.38* (73)
Self-determined extrinsic motivation (SDEM)	.25* (74)	.26* (73)	.26* (73)
Non self-determined extrinsic motivation (NSDEM)	.21** (74)	−.05 (73)	−.05 (73)
Amotivation (AM)	−.26* (74)	−.17 (73)	−.17 (73)

Note: * $p < .05$, ** $p < .10$, all other correlations are non significant. The number of participants appears in brackets

perceived competence) and outcome (the effort assessment). According to SDT, events enhancing feelings of perceived competence in a self-determined context should increase IM and identified regulation. In addition, those who are intrinsically motivated and display self-determined forms of motivation should experience more positive consequences such as expending more effort, and developing skills as assessed by the teacher. The converse relationships were expected with respect to non self-determined extrinsic motivation and amotivation. The overall results in Table 5 are supportive of these theoretical expectations. Specifically, both the self-report (the Ulrich and Collier 1990 scale) and teacher competence assessments displayed a simplex pattern with the intrinsic motivation to amotivation subscales. For example, the results from the Ulrich and Collier scale correlated significantly and positively with IM (.26), while a significant and negative correlation resulted with the amotivation subscale (−.26). The teachers' evaluations of student effort displayed the same pattern with correlations ranging from .38 with intrinsic motivation to −.17 (amotivation). These findings are particularly important as they show that the PMS subscales correlate as hypothesized with criteria of competence and effort.

Phase 4

Results from Phase 2 and 3 provided support for the reliability and validity of the PMS. However, one aspect of the PMS which was not assessed pertained to the usefulness of its pictorial dimension. The PMS was created with pictures to help participants derive meaning from the associated phrase. However, one may question the usefulness of these pictures. It might be that participants would respond just as well without them. In such a case, the pictures would not be useful. The purpose of Phase 4 was to address this issue. This was done by asking some of the same participants as in Study 3 to complete the PMS without the pictures. If their answers prove unreliable, this would be an indication that the pictures do play an important role in the scale. If not, then perhaps the written phrases would be sufficient. We hypothesized overall that the non-pictorial version would yield unreliable internal consistent (Cronbach alpha values) thereby supporting the usefulness of the pictorial aspect of the PMS.

Method

Participants

Permission to administer the written scale was obtained from the same individuals who had participated in Phase 3, a year after the initial data collection. Forty-seven individuals agreed to participate.

Instrument and procedures

The same experimenter from Phase 3 collected data in Phase 4 under identical procedures, in a quiet room except that the pictures were not shown to participants. The 16 written phrases were visible to the participants, but the experimenter read each statement to participants because many had difficulty with reading. Again, they were requested to indicate if each phrase was 'like me', 'a little bit like me', or 'not like me' which were printed in large letters on three separate cards. Internal consistency

(Cronbach's alpha) estimates were determined for each subscale.

Results

The reliability estimates were .91 for intrinsic motivation, .27 for identified regulation, .20 for external regulation, and .60 for amotivation. These values were considerably lower than those obtained in Phase 2 and 3 and suggested that the scale is not reliable without the pictures. These findings underscore the usefulness of the pictorial dimension of the PMS.

Discussion

Validity

Support for the validity of inferences from the PMS came from three sources: factor structure, simplex pattern, and concurrent validity correlations. They will be discussed in turn. The confirmatory factor analysis of Phase 2 revealed a four factor structure corresponding to the four motivational constructs. It thus appears that intrinsic motivation, self-determined extrinsic motivation, non self-determined extrinsic motivation, and amotivation are perceived as different constructs. Moreover, we expected athletes to report high intrinsic motivation toward sport and physical activity and low amotivation on a contextual level scale. This is exactly how the Special Olympians responded (Table 1). It would seem that the 16 pictures and phrases enabled individuals with an intellectual disability to distinguish among the four motivational constructs.

The correlations among the PMS subscales also provide evidence of construct validity. Because SDT (Deci and Ryan 1985, 1991) conceptualizes the four types of motivation to fall along a line of self-determination, one would expect correlations to be high and positive between adjacent types (e.g., AM and non self-determined extrinsic motivation) and low or negative between the most extreme scores of the continuum (i.e., IM and AM). In Phase 2 and 3 the highest positive and significant correlations were obtained between IM and self-determined extrinsic motivation $r = .49$ and .63, respectively and between self-determined extrinsic motivation and non self-determined extrinsic motivation $r = .37$ in both phases. Furthermore, as theory would predict, negative correlations were obtained with IM and AM ($r = -.44$ and $-.54$ in Phases 2 and 3) and between self-determined extrinsic motivation and AM ($r = -.35$ and $-.36$ in Phases 2 and 3). Overall, the correlation patterns supported the self-determination continuum with this particular clientele in physical activity. However, it should be underscored that the pattern of correlations in Phase 3 was not perfect as a nonsignificant correlation ($r = .03$) was obtained between the non self-determined extrinsic motivation and amotivation subscales. It is possible that this correlation reflects aspects of the adolescent sample, as the correlation was higher and significant in Phase 2 with the older Special Olympians. These individuals compete voluntarily and were generally older that the high school students who are in compulsory physical education classes. Overall, however, the simplex correlation patterns from two quite distinct groups with intellectual disabilities support the generalizability of the PMS.

The correlations and their pattern are consistent with results obtained by Poulin (1992) with adolescents with an intellectual disability in physical education, as with those obtained in sport and exercise with nondisabled participants (Brière et al. 1995; Pelletier et al. 1995) as well as in other domains (Pelletier et al. 1995b; Vallerand and O'Connor 1991; Vallerand 1989). It appears that the four types of motivation fall along a self-determined continuum, even for individuals with an intellectual disability (Deci and Ryan 1985, 1991).

Evidence of concurrent validity was sought primarily in Phase 3 by exploring the correlations between the four subscales of the PMS and the self-report index of competence (Ulrich and Collier 1990). According to the hierarchical model and SDT, events enhancing feelings of self-competence should increase intrinsic motivation and self-determined forms of extrinsic motivation and decrease non self-determined extrinsic motivation and amotivation. Results with the Ulrich and Collier scale yielded results generally in line with theory as correlations decreased from intrinsic motivation (.26) to amotivation (−.26). Only the correlation involving the non self-determined extrinsic motivation subscale did not lead to the expected results. Although the correlation ($r = .21$) was smaller than those involving the intrinsic motivation and self-determined extrinsic motivation subscales, it was nevertheless positive and significant. The physical competence scale (Ulrich and Collier) was chosen because it had been developed for youngsters with mild intellectual disabilities although they were younger than the current sample. The correlations may have been higher had a more appropriate scale been available. Nonetheless, these correlations reflect an overall pattern predicted by theory.

Phase 3 also determined correlations between the four subscales and the physical educator's rating scales. According to SDT, persons high in skill are likely to be particularly motivated toward physical activity while those who are low would tend toward amotivation. The pattern of results supported these predictions (Table 5). In fact, the predictions are even more dramatic when effort is considered. Adolescents who are intrinsically motivated or

regulated through forms of non self-determined extrinsic motivation expended higher levels of effort. Lower effort was associated with higher amotivation scores ($r = -.17$). As posited by Vallerand (1997), behavioral consequences such as effort are expected to be mainly affected in a positive fashion by intrinsic motivation and self-determined extrinsic motivation, and in a negative fashion by amotivation and somewhat less by non self-determined extrinsic motivation. It is noteworthy that the hypothesized pattern of results was obtained with all four subscales, although significant correlations were obtained only with intrinsic motivation and self-determined extrinsic motivation. These findings are particularly important because they were obtained with an objective source of assessment, namely the physical educators. Past research has often reported positive relations between students or athletes' intrinsic motivation and their subjective perceptions of effort (e.g., Kavussanu and Roberts 1996). In the present study, these findings were replicated with an objective measure of effort. In addition, it was found self-determined extrinsic motivation can also positively contribute to objective effort, although not to the same extent as intrinsic motivation. It would thus appear that motivation can differentially affect objective effort in line with current intrinsic and extrinsic motivation theorizing (Deci and Ryan 1985; Vallerand 1997, 2001). It is suggested that future validation research of the PMS look at other antecedents (e.g., perceptions of autonomy and relatedness) and outcomes (e.g., persistence, performance).

Reliability

The temporal stability of the subscales, assessed only in Phase 3 ranged from .57 (amotivation) to .78 (intrinsic motivation) are adequate considering that the PMS is a scale at the moderate, contextual level (Vallerand 1997 on this issue). While the test–retest score for amotivation ($r = .57$) was somewhat lower, such a score is in line with the temporal stability of the amotivation construct in other contextual scales and completed by students without a disability such as the academic motivation scale (Vallerand et al. 1992). Beginning with Poulin (1992) and continuing through these phases, amotivation has produced lower reliability coefficients than other subscales. Why this is the case is unclear, but it behooves users of the PMS to be cautious in their interpretations of amotivation and warrants additional research. Despite this limitation, it would thus appear that the motivation of individuals with an intellectual disability toward sport and physical activity is relatively stable.

Internal consistency was assessed by Cronbach alphas in Phase 2 and 3. Cronbach alphas yielded values ranging between .60 and .70 in Phase 2, thereby indicating that the four subscales are relatively internally consistent. In Phase 3 the internal consistencies at Time 1 ranged from .64 to .74, while those at Time 2 were considerably higher, ranging from .82 (intrinsic motivation) to .88 (amotivation). These findings imply that individuals with an intellectual disability benefit from some preparation before completing the PMS before completing the scale. Future research is needed in order to determine the extent and nature of such preparation. Despite our best efforts to ensure all participants understood 'like me', 'a little bit like me', and 'not like me', it is possible that they were not clearly distinguishable by some participants. Researchers and practitioners who use the scale must ensure that the respondents are prepared to do so, likely by additional practice with similar items and understand the meaning of the phrases 'like me', etc.

Effectiveness of pictures

The internal consistency of intrinsic motivation remained high (.9) without the pictures, presumably this concept is rather easily understood by words. Amotivation was .6 but this is considerably lower than with pictures at either Time 1 or 2 in Phase 3. Both forms of extrinsic motivation were very low. Generally therefore the results from Phase 4 support the use of the pictures in addition to the phrases. Individuals with an intellectual disability who participated benefited from the pictures and therefore they should be retained. It would appear that the pictorial framework is not only appropriate for those with limited reading and intellectual skills but quite essential.

Limitations and conclusions

The present research contains some limitations. First, it was conducted with children and adults with a moderate level of intellectual disability. Of course, the scale may be inappropriate for those with more severe forms of intellectual disability. Second, the scale does not assess all forms of intrinsic and extrinsic motivation independently. It was felt important to keep the number of motivational dimensions and items to a minimum because of the cognitive limitations of the participants. Future research should test whether subscales assessing other motivational concepts could be added to the present scale. Finally, the present research only assessed a limited number of variables associated with motivation (i.e., competence and effort). Future research is needed in order to extend the present research in assessing other types of variables thought to be linked to motivation (e.g., persistence, positive affect, etc.).

In conclusion, results from the four phases reported herein reveal that the PMS is an instrument with many

positive attributes. First, it is the only one designed to assess contextual motivation in a multidimensional fashion for individuals with an intellectual disability. It should be valuable in investigations of the physical activity patterns in individuals with an intellectual disability (Hoge and Dattilo 1995). Second, the reliability of the PMS is supported by internal consistency and temporal stability measures. Third, there is evidence of validity for the scale from confirmatory factor analyses, correlation patterns among the subscales, and by correlations between the PMS and antecedents and outcome variables completed by both students and teachers. Overall, participants with intellectual disabilities appear capable of differentiating among the four types of motivation. A final positive attribute is that the PMS may be also useful for young children who have limited reading abilities, but no disability. Of course, the validity of any instrument represents an ongoing concern and additional research is clearly warranted to continue to assess the psychometric properties of the PMS, but the present version enjoys sufficient reliability and validity to justify its use (e.g., Kozub 2003) and subsequent development.

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