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A Psychometric Validation of the Motives for Physical Activity Measure for Youth with Intellectual Disabilities (MPAM-ID)

Christophe Maïano^{a,b*}, Alexandre J. S. Morin^{b*}, Danielle Tracey^c, Cynthia Gagnon^d, Victoria Smodis McCune^b, Rhonda G. Craven^e

^aCyberpsychology Laboratory and Department of Psychoeducation and Psychology, Université du Québec en Outaouais (UQO), Saint-Jérôme, Canada.

^bSubstantive-Methodological Synergy Research Laboratory, Department of Psychology, Concordia University, Montreal, Canada.

^cSchool of Education, Translational Health Research Institute, Western Sydney University, Sydney, Australia

^dDepartment of Psychoeducation and Psychology, Université du Québec en Outaouais (UQO|Campus de Saint-Jérôme), Canada.

^eInstitute for Positive Psychology and Education, Australian Catholic University, Sydney, Australia

* The order of appearance of the first and second authors (C.M. and A.J.S.M.) was determined at random: Both should be considered first authors.

Acknowledgements: This study was supported by grants from the Australian Research Council (DP140101559) and from the Social Sciences and Humanities Research Council of Canada (430-2012-0091, 435-2014-0909).

Disclosure statement: No potential conflict of interest was reported by the author(s).

Corresponding author: Christophe Maïano, Université du Québec en Outaouais, Campus de Saint-Jérôme, Département de Psychoéducation et de Psychologie, 5 rue Saint-Joseph, Saint-Jérôme, Québec, J7Z 0B7, email: christophe.maiano@uqo.ca

This is the prepublication version of the following manuscript:

Maïano, C., Morin, A. J. S., Tracey, D., Gagnon, C., Smodis McCune, V., & Craven, R. G. (In Press, 2021). A Psychometric Validation of the Motives for Physical Activity Measure for Youth with Intellectual Disabilities (MPAM-ID). *Disability & Rehabilitation*. Doi: 10.1080/09638288.2021.1970828

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Implications for Rehabilitation

- We propose English and French adaptations of the Motives for Physical Activity Measure for Youth with Intellectual Disabilities (MPAM-ID);
- The MPAM-ID was able to identify the same motives as the original measure;
- The MPAM-ID will facilitate the assessment of motives for physical activity in cross-sectional and longitudinal studies;
- The MPAM-ID will facilitate the assessment of motives for physical activity among English- and French-speaking youth with ID;
- The MPAM-ID could be used to compare youth motives for physical activity as a function of their age, body-mass index, ID level, and frequency of sport involvement.

ABSTRACT

Purpose: To validate a version of the Motives for Physical Activity Measure (MPAM) adapted for youth with intellectual disabilities (ID).

Materials and Methods: A sample of 359 youth with mild to moderate ID from Australia and Canada respectively completed English and French versions of the MPAM-ID.

Results: Exploratory structural equation models supported the validity and reliability of the five-factor structure of the MPAM-ID, as well as the weak, latent variance-covariance and latent mean invariance across linguistic versions. Additional results supported the partial strong and strict invariance of most MPAM-ID items across linguistic versions. The results also supported the complete measurement invariance of the MPAM-ID over time, and revealed a lack of differential item functioning (DIF) as a function of youth's age, body-mass index (BMI), ID level, and frequency of sport involvement (FSI). However, partial DIF was found as a function of youth's sex. Additionally, latent mean differences in MPAM-ID's factors were found as a function of youth's ID level, sex and FSI. Finally, results supported the convergent validity of the MPAM-ID factors with a measure of perceived physical abilities.

Conclusion: The MPAM-ID can be used among English- and French-speaking youth with ID irrespective of their age, BMI, ID level, sex and FSI.

KEYWORDS: Motivation, Sport, Intellectual disability level, Measurement invariance, Special education needs.

INTRODUCTION

Children and young people with intellectual disabilities (ID) display a level of intellectual functioning characterized by limitations (i.e., an intelligence quotient [IQ] at least two standard deviations below the population average) accompanied by deficits in adaptive functioning skills in several areas (i.e., conceptual, social and/or practical) [1]. Several reviews have shown that youth with ID tend to be less physically active than their typically developing (TD) peers [2-5]. This trend continues into adulthood, with further increases in sedentary behaviors [6]. With research demonstrating that people with ID have a higher prevalence of social disadvantage and poorer health than their peers [2, 7-9], increasing physical activity provides them with a unique opportunity to address these health inequalities [2] and experiences of social exclusion [10]. Indeed, meta-analyses have highlighted the range of benefits associated with physical activity involvement for youth with ID on a range of physical (e.g., balance, body composition, cardiorespiratory fitness, etc.), behavioral (e.g., challenging behaviors, physical activity level, etc.) and psychological (e.g., self-concept, well-being, mental health) outcomes [e.g., 11-18].

Unfortunately, McGarty et al.'s [19] recent meta-analysis highlighted the rarity, and lack of efficacy, of interventions seeking to increase physical activity levels in youth with ID. This observation led to various calls for increases in theoretically-grounded research focused on the identification of drivers (i.e., barriers and facilitators) of physical activity involvement among youth with ID [19-21]. In this regard, the results from research examining the determinants of physical activity among people with ID have been synthesized in two systematic reviews [22, 23], leading to the identification of several personal (e.g., health concerns, motivation, preferences, rewards), social (e.g., lack of support from others, lack of opportunities), and environmental (e.g., location, lack of transportation) barriers and/or facilitators. Of direct relevance to the present study, these reviews identified motivation, or rather a lack of motivation, as one personal barrier to involvement in physical activity among youth with ID [23]. This observation thus provides an opportunity to capitalize on the significant body of research focusing on sport motivation among people without disabilities [e.g., 24, 25], in order to guide research conducted among people with ID [10]. However, attempts to apply motivation theories to increase the involvement of youth with ID faces an important challenge. Indeed, some have previously suggested that motivational theories may not be relevant for youth with ID, as they involve cognitive capacities that youth with ID may not possess [19, 26]. Furthermore, questionnaires developed among TD populations may not be directly applicable to youth with ID among whom the ability to obtain valid self-reports of internal states faces unique challenges [10]. Consequently, despite the urgent need to better understand the motivational factors driving physical activity involvement among youth with ID, strong empirical motivation research remains rare in this population [26].

Measurement of Motivation for Physical Activity/Sport among Youth with ID

To our knowledge, only two self-report questionnaires have been specifically developed and validated to measure sport motivation among people with ID: The Sport Motivation Questionnaire (SMQ) [27] and the Pictorial Motivation Scale (PMS) in physical activity and sport [28]. However, despite their interest, the SMQ and PMS are unable to cover the whole range of potentially important motivational processes involved in driving the involvement of young persons with ID in physical activity. Among the key components of physical activity, exercise or sport motivation not covered by these measures are the motives or reasons why people with ID may want to become involved in physical activity, exercise and sport [29]. Furthermore, the first of these questionnaires only focuses on achievement goals based on Nicholls's [30, 31] theory, the second exclusively focuses on motivation orientations (e.g., intrinsic, extrinsic) based on Vallerand's [32-34] theory.

In sport and exercise psychology, one of the most widely used questionnaires [29] to measure the motives for involvement in physical activity, exercise and sport is the Motivation for Physical Activity Measure (MPAM) [35]. The MPAM was initially developed and validated among a sample of 376 adults without ID. The MPAM includes 23 items and measures three types of motives based on the Self-Determination Theory [36]: (a) interest/enjoyment (6 items); (b) competence (7 items); and (c) body-related (10 items). A few years later, a revised 30-item version of the MPAM (MPAM-R) [37] was proposed, and validated among a sample of 155 adults without ID, to cover a broader range of motives for participation in physical activity, exercise, and sport, thus covering: (a) interest/enjoyment (7 items); (b) competence (7 items); (c) appearance (6 items); (d) fitness (5 items); and (e) social (5 items). In both versions, responses are provided using a 7-point Likert scale ranging from "Not at all

true for me” to “Very true for me”. So far, the MPAM-R has been cross-validated in other languages, such as Portuguese from Brazil [38, 39], Czech [40], Italian [41], and Spanish from Spain [42] or Columbia [43]. The results from these cross-linguistic studies have supported the *a priori* five-factor structure of the original version and provided evidence of scale score reliability for the MPAM-R’s subscales ($\alpha = .75-.94$ across studies). This questionnaire was thus retained, and preferred to the SMQ and the PMS, for two reasons. First, in contrast to the SMQ and PMS, the MPAM-R was specifically designed to assess motives for physical activity, exercise and sport participation, and focuses on the motives most frequently reported by participants. Second, it is widely used in research, and has been cross-validated in several languages, thus facilitating the comparison of results obtained among youth with ID with those obtained among TD youth from several countries, cultures, or languages.

Objectives of the Study

The goal of this study is to develop and validate a simplified version of the MPAM-R that would be suitable to cover the five motives among youth with ID (i.e., using a reduced set of three items per subscales adapted to be easy to understand among this population), namely the MPAM-ID. To maximise the utility and applicability of the resulting measure, we simultaneously propose and validate English and French versions of this new instrument. More specifically, we first examine the factor validity and reliability of the MPAM-ID among a sample of youth with ID. Second, we verify whether the factor structure of the MPAM-ID is invariant across the linguistic versions. Third, we examine the presence of differential item functioning (DIF) and latent mean differences on the MPAM-ID as a function of frequency of sport involvement and characteristics of youth with ID (i.e., age, body-mass index [BMI], ID level, and sex). Most of these variables (except for ID level) have been previously examined in relation to the MPAM-R among TD youth [e.g., 44-46]. More specifically, these previous studies revealed significant mean differences in youth’s motives for physical activity/sport as a function of their age (e.g., older participants tended to score significantly higher than younger ones for most motives) [46], BMI (e.g., overweight participants tended to score significantly lower on most motives than normal weight participants) [46], sex (e.g., boys tend to score significantly higher than girls for most motives, except for appearance [45, 46] although they have also been found to score significantly higher than girls for appearance motives [44]), and involvement in physical activity/sport (e.g., higher levels of involvement tended to be accompanied by higher scores on most motives) [44, 45]. Fourth, we sought to confirm the positive correlations observed among TD youth [e.g., 47, 48] by examining whether youth’s motives for physical activity would be related (i.e., convergent validity) with a measure of physical self-perceptions (i.e., perceived physical abilities). Finally, we examine the longitudinal measurement invariance and stability of MPAM-ID ratings over a one-year interval. The decision to rely on this longer time frame was anchored in a desire to assess longitudinal stability, rather than test-retest reliability, to assess whether and how the MPAM-ID can be used in the context of longitudinal studies aiming to capture fluctuations of motives.

METHODS

Participants

A sample of 359 youth with mild (corresponding to IQ scores between 50 and 70) to moderate (corresponding to IQ scores between 35 and 49) ID participated in this study. ID classifications were determined using IQ scores available in the school records that are in line with the revised fourth version of the Diagnostic and Statistical Manual of Mental Disorders [49]. These participants were recruited in secondary schools or community organizations located in Australia (English speaking; $N = 237$) and Canada (French-speaking; $N = 122$). One year later, 233 youth (162 from Australia and 71 from Canada) completed the MPAM-ID. Descriptive statistics about youth’s age, BMI, sex, ID levels and weekly frequency of sport involvement at both time points are presented in Table 1.

Procedures

Permission to conduct the study was obtained from the research ethics committees of the first, third, and last authors’ Universities. Participants were recruited in schools or community organizations that agreed to support this proposal. No compensation was offered for participation in Australia, whereas Canadian participants were eligible to win one out of 40 gift certificates (\$30 CAD) annually. Parents (or legal representatives) of all participating youth with ID actively provided signed informed consent for their children’s participation. For parents of youth recruited in schools (100% in Australia; 90.2% in Canada), this consent form was directly sent to the parents by the school, with an information letter, and the signed consent form was returned to the school where members of the research team

recuperated it. Parents (or legal representatives) recruited outside of the participating schools (0% in Australia; 9.8% in Canada) were directly met in person in community organizations or informed about the study via information transmitted by the community organizations. Those who were interested to participate received this material directly from the research team or by an envelope sent to their postal addresses. They returned the signed consent form to the researchers using a reply-paid envelope. Parents (or legal representatives) were contacted again one year later by phone by the research team to confirm their consent for their children's participation.

The consent procedure granted the researchers access to school records, including youth's most recent level of intellectual functioning (only youth with an official school-based ID classification were recruited). This information was collected and transmitted by the schools to the research team for all participants. The Weschler [50] Intelligence Scale for Children – Fourth Edition (WISC-IV) was the IQ test most frequently used by the schools in both countries. When the last IQ assessment in the school records was older than four years, a new IQ assessment was conducted by a registered psychologist using the WISC-IV, the Weschler Adult Intelligence Scale-IV, or the Leiter international performance scale-revised [51], depending on age and verbal ability.

Participating youth were met at their school (or at a time and location most convenient for the parents for participants recruited outside of schools) by members of the research team or trained research assistants who explained the goals and procedures of the study, as well as youth's right not to participate or to withdraw from the study without any consequences. Thus, youth were asked to actively and voluntarily consent to participate in the study. They were contacted again by the research team (by phone or in person at school) one year later to confirm their consent to participate and to set up a meeting for those recruited outside of schools or who had moved out of their schools (in which case, the meeting was set up with the parent). Using sample questions for each questionnaire section, research assistants explained how to use the response scales (all involving graphical displays and pictograms). Testing was realized in small groups including up to 8 youth with mild ID or including 1 or 2 youth with moderate ID. Youth's height and weight were directly measured by members of the research team during data collection. For the questionnaires, a read-aloud assisted procedure was utilized to maximize understanding, and youth were encouraged to ask questions. Sometimes, despite the available support, youth remained unable to understand an item. In these instances, they were instructed to select the "do not understand the statement" option. Those responses (0.6% to 2.6%; $M = 1.33\%$) were treated as missing values.

Measures

Youth's Characteristics. Youth's age (i.e., determined by date of birth), sex, and ID level were extracted from the school records transmitted by the schools to the research team. Youth's height was measured using a stadiometer (Tanita HR200), and their weight was measured using a scale (Tanita BF-350). These measures were then used to calculate their BMI [$\text{Weight}/(\text{Height}^2)$]. Information about involvement in sports practice outside of the school context were obtained directly from the youth (i.e., "*Do you practice sport when you are not at school (for example, in the evenings or on weekends?)*"; If yes, "*Last week, which days did you practice sport?*"). The term sport was used as a generic term, easier to grasp by youth with ID, to refer to any form of physical activity, exercise, or sport. This was explained to participants during data collection using various examples (e.g., riding a bicycle, running, playing soccer, etc.) and reinforcing the physically active nature of these activities.

Motives for Physical Activity. The process via which the MPAM-R was adapted for youth with ID (to create the MPAM-ID), pursued four objectives: (1) to examine the appropriateness of the format and clarity of MPAM-R for use among youth with ID, and to select an optimal set of three items per subscale; (2) to adapt (i.e., sentences, wording, response scale, use of pictograms) the MPAM-R to increase its clarity and ease of application among youth with ID; (3) to conduct a translation back-translation procedure to create an equivalent French version of the MPAM-ID; and (4) to test and develop a final version of the MPAM-ID among a pilot sample of youth with ID. A detailed description of these procedures is reported in section S1 in the online supplements. Permission to use and adapt the original MPAM-R was granted by Richard M. Ryan.

The resulting questionnaire includes 15 items measuring interest/enjoyment (INTE; 3 items), competence (COMP; 3 items), appearance (APP; 3 items), fitness (FIT; 3 items), and social (SOC; 3 items). Youth were asked to indicate their degree of agreement with each item using a 5-point graphical response scale ranging from "No, I totally disagree" (associated with a very unhappy face) to "Yes, I

totally agree” (associated with a very happy face). The English and French items and response scales of the MPAM-ID are presented in the Appendix (the complete questionnaire is available upon request from the corresponding author).

Perceived Physical Abilities. English and French versions of the perceived physical abilities subscale of the Self-Description Questionnaire I – Individual Administration for (SDQ-IA-ID) [52] were used. The perceived physical abilities subscale includes eight items (e.g., “I like to run and play hard”, “I have strong muscles”). For purposes of this study, the original response scale (i.e., “No, always” to “Yes, always”) was replaced by a six-point graphical response scale (i.e., “No, I totally disagree” associated with a very unhappy face to “Yes, I totally agree” associated with a very happy face).

Data analysis

All analyses were conducted using Mplus 8.5 [53] maximum likelihood robust (MLR) estimator, which is robust to univariate and multivariate non-normality, and using full-information maximum likelihood procedures to handle the limited amount of missing data (Time 1: 1.16%-4.64%, $M = 2.38\%$; Time 2: 0.43%-2.58%, $M = 1.26\%$). First, a solution matching the *a priori* factor structure of the MPAM-ID was estimated among the total sample while contrasting a confirmatory factor analytic (CFA) with an exploratory structural equation modeling (ESEM) approach. The decision to contrast both approaches is linked to the conclusions from: (a) statistical research showing that the incorporation of cross-loadings to a measurement model results in a more accurate representation of the constructs and of their associations as long as cross-loadings as small as .100 are present in the population model [e.g., 54, 55]; (b) applied research supporting the value of ESEM representations for measures of motivation [e.g., 56-58]. The CFA solution hypothesized that the MPAM-ID would be explained by five correlated factors, that no cross-loadings would be needed, and that error terms would be uncorrelated. Then, the *a priori* ESEM model was estimated using confirmatory target rotation procedure [59, 60]. This solution was specified in the same manner as the CFA solution, but allowed all cross-loadings to be freely estimated albeit “targeted” to be as close to 0 as possible. The composite reliability of MPAM-ID latent factors was estimated using McDonald’s [61] omega (ω). Model fit was assessed using [e.g., 62, 63]: Comparative fit index, Tucker-Lewis index, and the root mean square error of approximation. CFI and TLI values $\geq .90$ or $> .95$ and RMSEA values $\leq .08$ or $< .06$ respectively indicated acceptable and excellent fit.

Second, the measurement invariance of participants’ responses to the MPAM-ID was tested across subsamples of English-Australian and French-Canadian participants to verify the linguistic equivalence of both versions of the questionnaire in the following sequence [64]: (a) configural invariance; (b) weak invariance (loadings); (c) strong invariance (intercepts); (d) strict invariance (uniquenesses); (e) invariance of latent variances and covariances; and (f) invariance of the latent means. Model comparisons (i.e., with each model contrasted to the previous one) relied on changes (Δ) in CFI, TLI, and RMSEA. Invariance was supported when Δ CFI and Δ TLI were $\leq .01$ and Δ RMSEA were $\leq .015$ [65, 66].

Third, a multiple indicators multiple causes (MIMIC) model was used to examine [67, 68]: (a) the associations between predictors [i.e., age, BMI, ID level (mild coded 0 and moderate coded 1), sex (girls coded 0 and boys coded 1), and frequency of sport involvement] and MPAM-ID latent factors; and (b) probable DIF, that is the direct association between the predictors and MPAM-ID item response over and above the association between the predictors and the MPAM-ID latent factors. More specifically, these models were estimated in the following sequence [67, 68]: (a) null effects model (the paths from the predictors to the MPAM-ID latent factors and item responses were constrained to be zero); (b) saturated model (the paths from the predictors and the MPAM-ID item responses were freely estimated, while the paths from the predictors to the MPAM-ID latent factors were constrained to be zero); and (c) factors-only model (the paths from the predictors to the MPAM-ID latent factors were freely estimated, while the paths from the predictors to the MPAM-ID item responses were constrained to be zero). To facilitate interpretations, age, BMI, and frequency of sport involvement were standardized prior to the analyses. As for previous comparisons, a substantial improvement in model fit (Δ CFI and Δ TLI $> .01$ and Δ RMSEA $> .015$) in the factors-only and saturated models relative to the null effects model provides support for an association between MPAM-ID item responses and the predictors. However, an improvement in model fit for the saturated model relative to the factors-only model indicates DIF [67, 68].

Fourth, we assessed the convergent validity of the MPAM-ID latent factors in relation to the self-reported measure of perceived physical abilities of the SDQ-IA-ID (specified as one latent factor). Fifth, a final set of analyses was then conducted to assess the longitudinal measurement invariance of the MPAM-ID over time following procedures identical to those described above for tests of linguistic invariance [64]. The most invariant model was then used to obtain estimates of one-year stability for each latent factor.

RESULTS

Factor Validity and Reliability of the MPAM-ID

The goodness-of-fit of the a priori CFA and ESEM solutions are reported in Table 2 (models 1-1 to 1-2). These results reveal that both models were able to achieve an excellent level of fit to the data, although the fit of the ESEM solution was substantially higher than that of the CFA solution ($\Delta\text{CFI} = +.020$; $\Delta\text{TLI} = +.025$, $\Delta\text{RMSEA} = -.013$). The detailed parameter estimates from the CFA and ESEM solutions are respectively reported in Tables 3 and 4. In the CFA solution, the main factor loadings ($\lambda = .605-.859$, $M_\lambda = .779$) were all reasonably high, and resulted in acceptable to excellent coefficients of composite reliability for all factors ($\omega = .756-.878$, $M_\omega = .822$). Likewise, the ESEM solution also resulted in reasonably high main factor loadings ($\lambda = .379-.882$, $M_\lambda = .661$) and estimates of composite reliability ($\omega = .720-.855$, $M_\omega = .785$). In addition, although the ESEM solution revealed reasonably small cross-loadings, many of those cross loadings were higher than .100 and thus non-negligible ($|\lambda| = .001-.291$, $M_{|\lambda|} = .087$). Furthermore, the latent correlations observed between the factors in the CFA solution ($r = .644-.864$, $M_r = .770$) were high enough to call into question their distinguishability. In contrast, latent factor correlations were substantially smaller in the ESEM solution ($r = .517-.697$, $M_r = .610$), supporting the presence of more differentiated, yet inter-related, factors. When this happens, recommendations indicate that the ESEM solutions should be retained [54, 69]. The ESEM solution was thus retained for further analyses.

Measurement Invariance Across Linguistic Versions

The goodness-of-fit of the linguistic measurement invariance models are reported in Table 2 (models 2-1 to 2-8). These results first supported the configural (model 2-1) and weak (factor loadings; model 2-2) invariance of this model. Nevertheless, these results also revealed a lack of strong (intercepts; model 2-3) and strict (uniqueness; model 2-5) invariance. Examination of the parameter estimates from the previous solution (i.e., weak invariance) and of the modification indices associated with the failed solutions of strong and strict invariance, suggest that this lack of invariance might be limited to the intercept of one item (COMP3: “Because I want to get better physically”) and to the uniquenesses of two items (INTE2: “Because I like to do sports”, FIT2: “Because I want to improve my physical fitness”). As a result, models of partial strong (model 2-4), and partial strict (model 2-6) invariance in which equality constraints were relaxed on these non-invariant parameters were supported by the data. These results suggest that scores on COMP3 tended to be higher among Australian participants than among Canadian participants with similar levels on the competence factor. These results also revealed that the uniquenesses associated with items INTE2 and FIT2 tended to be higher among Australian participants than among Canadian ones, suggesting a higher level of random measurement error on these two items. Finally, the results also supported the invariance of the latent variances-covariances (model 2-7) and means (model 2-8) across the two linguistic subsamples.

DIF and Latent Mean Differences

The results from the MIMIC models are reported in Table 2. For age and BMI, these results showed that both the saturated (models 3-2 and 4-2) and factors-only (models 3-3 and 4-3) models did not result in a substantial improvement in model fit relative to the null effects model (models 3-1 and 4-1). These results thus indicate a lack of DIF as well as a lack of association between these predictors and scores on the MPAM-ID latent factors.

For ID level and frequency of sport involvement, the results showed that both the saturated (models 5-2 and 7-2) and factors-only (models 5-3 and 7-3) models resulted in a substantial improvement in model fit relative to the null effects model (models 5-1 and 7-1). These results thus support the idea that ID level and the frequency of sport involvement were significantly associated with MPAM-ID responses. Additionally, the saturated (models 5-2 and 7-2) and factors-only (models 5-3 and 7-3) models were found to present a comparable level of fit to the data (ΔCFI and $\Delta\text{TLI} \leq .01$ and $\Delta\text{RMSEA} \leq .015$), suggesting a lack of DIF. Results from the more parsimonious factors-only model revealed that: (a) youth with moderate ID tended to score significantly higher on the interest/enjoyment

(.133, $p = .04$), appearance (.218, $p < .001$), and social (.208, $p = .006$) motives latent factors relative to youth with mild ID; and (b) youth more frequently involved in sport practices tended to score significantly higher on the interest/enjoyment (.344, $p < .001$), competence (.229, $p = .004$), appearance (.209, $p = .001$), fitness (.185, $p = .022$), and social (.222, $p = .001$) motives latent factors relative to youth less frequently involved in sport practices.

For sex, the results showed that both the saturated (model 6-2) and factors-only (model 6-3) models resulted in a substantial improvement in model fit relative to the null effects model (model 6-1). These results thus support the idea that sex is significantly associated with MPAM-ID responses. In addition, the factors-only model resulted in a substantially lower level of fit to the data than the saturated model ($\Delta CFI = -.008$, $\Delta TLI = -.018$, $\Delta RMSEA = +.011$), thus suggesting the presence of DIF. Examination of the parameter estimates from the saturated model and of the modification indices associated with the factors-only model suggested that direct effects of sex on COMP2 (“Because I like to succeed at doing difficult things”) and APP1 (“Because I want to have more muscles to look better”) items needed to be added to the factors-only model. Therefore, a fourth model of partial DIF was estimated (model 6-4), and was supported by the data. Results from this model showed that boys with ID tended to score higher on the appearance (.138, $p = .036$) motive latent factor relative to girls with ID, and that boys with ID tended to score higher than girls with ID on COMP2 (.128, $p = .022$) and APP1 (.103, $p = .012$).

Convergent validity

As shown in Table 2 (Model 1-3), the structural equation model including the MPAM-ID latent factors and the convergent measure of perceived physical abilities resulted in an acceptable level of fit (Table 2). Results showed that the perceived physical abilities scale has acceptable psychometric properties. Indeed, factor loadings were all substantial and significant (.553 to .814), and accompanied by an excellent composite reliability coefficient ($\omega = .876$). Latent factor correlations from this model are reported in Table 5, and reveal that all latent factors from the MPAM-ID were significantly and positively related to youths’ perceived physical abilities.

Longitudinal Measurement Invariance

The goodness-of-fit of the models used to test the longitudinal measurement invariance of the MPAM-ID (models 8-1 to 8-6) are reported in Table 2. These results support the complete measurement invariance (weak, strong, strict, as well as latent variances-covariances, and means) of the MPAM-ID factors over time. The results from the most invariant of these models (i.e., latent means invariance) revealed a one-year stability correlation of .657 for INTE, .526 for COMP, .697 for APP, .447 for FIT, and .652 for SOC factors of the MPAM-ID.

DISCUSSION

The present results are encouraging regarding the ability of the MPAM-ID to accurately capture the motives for involvement in physical activity, exercise and sport among youth with ID. More specifically, they suggested that this instrument can reliably and validly be used in the context of epidemiological studies to capture these motives among English- and French-speaking boys and girls with mild and moderate ID irrespective of their age, BMI, and frequency of sport involvement. However, the present results also suggest that some caution, limited to a subset of items, is required when using the MPAM-ID to compare boys and girls with ID, as well as English- and French-speaking youth with ID, either via the reliance on latent variable analyses, or the deletion of the limited subset of items evidencing DIF. Yet, the MPAM-ID appears to be a valuable tool to empower youth with ID by providing an avenue for self-expression, voice, and agency in research seeking to better capture their internal states, and one deserving of further investigation.

The first objective of this study was to examine the factor validity and reliability of English and French versions of the MPAM-ID. The results supported the reliability and factor validity of the *a priori* five-factor structure of the MPAM-ID, among the current sample of youth with ID. Furthermore, our results add to previous research evidence suggesting that ESEM measurement models (including cross-loadings) were best suited to represent the measurement structure of motivation measures [56-58], suggesting that these conclusions also apply to the MPAM-ID. These results thus support the idea that the MPAM-ID measures the same motives than the original MPAM-R (i.e., interest/enjoyment, competence, appearance, fitness, and social), which could facilitate the comparison of results obtained among French- and English-speaking samples of youth with and without ID.

Our second objective was to examine the measurement invariance of the factor structure of the MPAM-ID across linguistic versions. In this regard, our results supported the equivalence of the factor

loadings, of all but one item's intercept (COMP3), of all but two items' uniquenesses (ITE2, FIT2), and of the latent variances, covariances, and means across both linguistic subsamples. This indicates that items from both linguistic versions of the MPAM-ID can be considered equivalent and can be confidently used among samples of English- and French-speaking youth with ID. However, observing that the measurement invariance of the intercepts and uniqueness was not complete reinforces the importance of relying on latent variable models, such as those used in the present study, in research seeking to contrast English- and French speaking participants. Alternatively, practical applications relying on scale scores should consider removing these items from the calculation when the goal is to contrast English- and French-speaking youth with ID. Importantly, the current results do not allow us to distinguish whether the source of this non-invariance can be clearly attributed to the linguistic version of the questionnaires, in which case this would suggest considering a revision of these items to further maximise their equivalence, or to the reliance on samples recruited within different countries (i.e., Australia and Canada) with their own sport culture, weather (allowing or restricting the practice of outdoor sports), and educational systems. Future research will be needed to better disentangle these two possibilities (for example by contrasting English- and French-speaking Canadian youth with ID).

Our third objective was to examine the presence of DIF and latent mean differences as a function of several predictors. Our results revealed a lack of DIF as a function of age, BMI, ID level, and frequency of sport involvement and a partial DIF as function of sex. This indicates that manifest or latent scores on the MPAM-ID factors can be confidently used to compare youth with ID as a function of their age, BMI, ID level, and frequency of sport involvement. Likewise, sex-related comparisons involving the fitness, social, and interest/enjoyment can also be conducted with no risk of biases. Sex-related comparisons should be conducted more cautiously (i.e., using latent variable methodologies to account for the presence of DIF, or after removing the items associated with the DIF) in relation to the appearance and competence factors.

Furthermore, beyond providing evidence that DIF was rare in relation to these personal characteristics of youth with ID, our analyses also revealed the presence of true latent means differences on some of the MPAM-ID factors as a function of these variables. More precisely, our results are generally aligned with those from previous studies conducted among TD youth [e.g., 44, 46] in showing that youth already involved more frequently in physical activity tended to endorse all motives as being more important than their peers less frequently involved in physical activity. Likewise, contrasting with some [45, 46], but not all [e.g., 44] previous results obtained among TD youth, our results showed that boys tended to present higher levels of motives to become involved in physical activity for appearance than girls. This result should be replicated in research designed to identify the reasons underlying this difference (e.g., physical activity might represent a more frequent approach to manage physical appearance for boys than for girls, who might for example rely on dieting as a more favored approach). Finally, youth with moderate ID tended to report higher levels of motives to become involved in physical activity for interest/enjoyment, appearance, and social reasons than youth with mild ID. Thus, contrasting with their peers with mild ID, it seems that involvement in physical activity, exercise or sport could be seen by youth with moderate ID as a more effective way of dealing with the social isolation/exclusion [70] and appearance issues (e.g., overweight or obesity) [7-8] that are frequently experienced by youth with ID. This possibility, would explain why these motives (having fun, playing with others, and improving their appearance) seem to be more pronounced among youth with moderate, rather than mild ID. Nevertheless, given that, to our knowledge, this is the first study to examine motives for physical activity among youth with ID, these interesting results should be replicated, and the reason for them examined more thoroughly, in future research.

Our fourth objective was to examine the convergent validity of the MPAM-ID in relation to perceived physical abilities. In conformity with previous results obtained among TD youth [e.g., 47, 48], our results showed that youth with ID who endorsed each motive as important also tended to report higher levels of perceived physical abilities. These significant relationships could be explained by the competence motivation theory developed by Harter [71] and adapted to the physical activity and sport context by Weiss and colleagues [72-73]. In this theory, physical competence (perceived and objective) and motivation are positioned as key drivers of involvement in physical activity, exercise, and sport. More precisely, this theoretical perspective suggests that youth tend to be motivated to be involved in physical activity, exercise, and sport in which they see themselves to be more competent. Our results support this assertion by revealing that youth with ID who view themselves as more physically

competent tend to be more highly motivated to be involved in physical activity, exercise, and sport.

Our last objective was to examine the longitudinal measurement invariance of the MPAM-ID factor structure over a one-year interval. Our results supported the full invariance of the factor structure of the MPAM-ID across a one-year interval, and revealed moderate levels of stability, ranging between .447 and .697 across dimensions. It should be noted that these correlations do not provide pure estimates of test-retest *reliability*, which needs to be measured over a much shorter time period (i.e., one week to a month) over which scores are expected to stay unchanged. Rather, these coefficients reflect longitudinal stability and the extent to which ratings on the MPAM-ID demonstrate stability (encompassing both a lack of random measurement error and a lack of true change) over time. These results are consistent with the theoretical nature of motivational processes, which are assumed to dynamically emerge, fluctuate, and change over time in interaction with the environment [e.g., 36], as well as with previous studies conducted among populations without ID, in which motivation has been shown to be moderately stable over time among young persons [e.g., 74-76]. These results suggest that these ratings are only moderately stable over a one-year period. This observation highlights the need to incorporate measures of motives of involvement in physical activity at least once a year in the context of longitudinal studies to best capture these fluctuations.

Despite its strengths, the present study has limitations that should be considered when interpreting the results. First, the MPAM-ID was validated using a single sample of English-Australian and French-Canadian youth with mild or moderate ID who did not present severe sensory or physical deficits. The extent to which these results would generalize to other samples of youth with more severe ID, to youth presenting more severe deficits, to younger or older populations, to participants from other English and French speaking countries, or to other linguistic versions, thus remains unknown. Therefore, it would be important for future studies to investigate the replicability of our results with more diversified samples of youth with ID.

Second, tests of the convergent validity of the MPAM-ID were incomplete. More precisely, additional analyses remain to be conducted in relation to other measures of sport motivation, to more objective indicators of the nature and intensity of physical activity, to measures of perceived or objective barriers to participation in physical activity (e.g., transport, parental support, physical limitations, etc.), and to measures of youth's physical self-conceptions more closely matching the motives covers on the MPAM-ID (e.g., fitness, social).

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TABLES

Table 1
Descriptive Statistics of Participants

Characteristics of participants	M or %	SD	Range
<i>Age (in years)</i>			
Overall sample – T1	15.82	2.18	11.92–21.52
Overall sample – T2	17.16	2.34	13.00–22.53
Australian sample – T1	15.22	1.67	11.92-18.89
Australian sample – T2	16.03	1.82	13.00-20.77
Canadian sample – T1	16.73	2.53	12.50-21.52
Canadian sample – T2	17.98	2.34	13.85-22.53
<i>Body mass-index (in kg/m²)</i>			
Overall sample – T1	23.67	6.43	14.50-50.11
Overall sample – T2	23.60	5.74	14.78-48.55
Australian sample – T1	23.46	6.20	14.70-48.94
Australian sample – T2	23.41	5.51	14.78-48.55
Canadian sample – T1	24.08	6.86	14.50-50.11
Canadian sample – T2	24.02	6.24	15.47-40.29
<i>Boys/Girls</i>			
Overall sample – T1	60.7%/39.3%		
Overall sample – T2	61.8%/38.2%		
Australian sample – T1	67.1%/32.9%		
Australian sample – T2	67.3%/32.7%		
Canadian sample – T1	48.4%/51.6%		
Canadian sample – T2	49.3%/50.7%		
<i>Mild/Moderate ID level</i>			
Overall sample – T1	51.5%/48.5%		
Overall sample – T2	47.3%/52.7%		
Australian sample – T1	60.6%/39.4%		
Australian sample – T2	56.8%/43.2%		
Canadian sample – T1	31.7%/68.3%		
Canadian sample – T2	24.6%/75.4%		
<i>Week frequency of sport practice (days/week)</i>			
Overall sample – T1	1.75	2.09	0-7
Overall sample – T2	1.55	1.92	0-7
Australian sample – T1	1.62	2.07	0-7
Australian sample – T2	1.41	1.93	0-7
Canadian sample – T1	2.01	2.12	0-7
Canadian sample – T2	1.90	1.84	0-7

Notes. M = mean; SD = standard deviation; ID = intellectual disability; T1 = initial measure; T2 = one-year later.

Table 2*Goodness-of-Fit for the Confirmatory Factor Analytic (CFA) and Exploratory Structural Equation Modeling (ESEM) Solutions for the MPAM-ID*

Models	N°	Description	R χ^2 (df)	CFI	TLI	RMSEA	RMSEA 90% CI	CM	$\Delta R\chi^2$ (df)	Δ CFI	Δ TLI	Δ RMSEA
Measurement Models	1-1	CFA	114.966(80)**	.975	.961	.036	.019-.049	-	-	-	-	-
	1-2	ESEM	47.459(40)	.995	.986	.023	.000-.046	-	-	-	-	-
	1-3	Convergent validity	298.079(175)*	.952	.931	.045	.036-.053	-	-	-	-	-
MI: Linguistic	2-1	Configural invariance	130.983(80)*	.968	.916	.061	.041-.079	-	-	-	-	-
	2-2	Weak invariance	192.107(130)*	.961	.937	.053	.036-.068	2-1	68.10(50)	-0.007	+0.021	-0.008
	2-3	Strong invariance	244.053(140)*	.935	.902	.066	.052-.079	2-2	15.08(10)	-0.026	-0.035	+0.013
	2-4	Partial strong	211.364(139)*	.955	.931	.055	.039-.069	2-2	41.78(9)*	-0.006	-0.006	+0.002
	2-5	Strict invariance	252.397(154)*	.938	.916	.061	.047-.074	2-4	33.13(15)*	-0.017	-0.015	+0.006
	2-6	Partial strict invariance	235.428(152)*	.948	.928	.056	.042-.070	2-4	22.24(13)	-0.007	-0.003	+0.001
	2-7	Variances-covariances invariance	245.377(167)*	.951	.938	.052	.037-.066	2-6	17.40(15)	+0.003	+0.010	-0.004
	2-8	Latent means invariance	259.937(172)*	.945	.933	.054	.040-.068	2-7	16.66(5)*	-0.006	-0.005	+0.002
DIF: Age	3-1	Null effects	68.397(55)	.991	.980	.026	.000-.044	-	-	-	-	-
	3-2	Saturated	49.718(40)	.993	.980	.026	.000-.047	3-1	18.69(15)	+0.002	.000	.000
	3-3	Factors-only	64.527(50)	.990	.977	.029	.000-.047	3-1	3.68(5)	-0.001	-0.003	+0.003
DIF: Body- mass index	4-1	Null effects	70.068(55)	.990	.978	.028	.000-.046	-	-	-	-	-
	4-2	Saturated	49.759(40)	.993	.980	.026	.000-.047	4-1	20.73(15)	+0.003	+0.002	-0.002
	4-3	Factors-only	59.187(50)	.994	.985	.023	.000-.043	4-1	13.28(5)	+0.004	+0.007	-0.005
DIF: ID level	5-1	Null effects	76.054(55)	.986	.969	.033	.010-.049	-	-	-	-	-
	5-2	Saturated	46.015(40)	.996	.988	.021	.000-.043	5-1	34.47(15)*	+0.010	+0.019	-0.012
	5-3	Factors-only	59.332(50)	.994	.985	.023	.000-.043	5-1	19.96(5)*	+0.008	+0.016	-0.010
DIF: Sex	6-1	Null effects	84.829(55)*	.980	.956	.039	.021-.055	-	-	-	-	-
	6-2	Saturated	46.849(40)	.995	.986	.022	.000-.044	6-1	45.81(15)*	+0.015	+0.030	-0.017
	6-3	Factors-only	69.711(50)	.987	.968	.033	.010-.051	6-1	16.09(5)*	+0.007	+0.012	-0.006
	6-4	partial DIF	62.199(48)	.990	.976	.029	.000-.047	6-2	26.81(8)*	-0.005	-0.010	+0.007
DIF: FSI	7-1	Null effects	87.901(55)*	.978	.952	.041	.024-.057	-	-	-	-	-
	7-2	Saturated	47.465(40)	.995	.985	.023	.000-.045	7-1	45.89(15)*	+0.017	+0.033	-0.018
	7-3	Factors-only	56.594(50)	.996	.989	.019	.000-.041	7-1	34.38(5)*	+0.018	+0.037	-0.022
MI: Time	8-1	Configural invariance	479.270(265)*	.931	.886	.047	.041-.054	-	-	-	-	-
	8-2	Weak invariance	466.913(315)*	.951	.932	.037	.029-.043	8-1	40.59(50)	+0.020	+0.046	-0.010
	8-3	Strong invariance	480.216(325)*	.950	.933	.036	.029-.043	8-2	12.44(10)	-0.001	+0.001	-0.001
	8-4	Strict invariance	471.422(340)*	.958	.946	.033	.025-.040	8-3	5.86(15)	+0.008	+0.013	-0.003
	8-5	Variances-covariances invariance	455.362(355)*	.968	.960	.028	.020-.035	8-4	6.99(15)	+0.010	+0.014	-0.005
	8-6	Latent means invariance	462.536(360)*	.967	.960	.028	.020-.035	8-5	7.52(5)	-0.001	.000	.000

Notes. * $p \leq .01$; MPAM-ID = Motives for Physical Activity Measure adapted for youth with Intellectual Disabilities; R χ^2 = robust chi-square; $\Delta R\chi^2$ = robust chi-square difference tests; Δ = change from previous model; CFI = comparative fit index; CM = comparison model; df = degrees of freedom; DIF = differential item functioning; ID = intellectual disability; MI = measurement invariance; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; FSI = frequency of sport involvement; TLI = Tucker-Lewis index.

Table 3*Standardized Parameters Estimates from the Confirmatory Factor Model of the MPAM-ID*

Items	ITE (λ)	COMP (λ)	APP (λ)	FIT (λ)	SOC (λ)	δ
INTE1	.842					.291
INTE2	.842					.290
INTE3	.837					.299
COMP1		.725				.474
COMP2		.605				.634
COMP3		.802				.356
APP1			.768			.410
APP2			.840			.295
APP3			.793			.371
FIT1				.748		.440
FIT2				.840		.295
FIT3				.859		.262
SOC1					.659	.566
SOC2					.823	.323
SOC3					.703	.505
ω	.878	.756	.843	.857	.774	
<i>Latent Factor Correlations (Pearson)</i>						
INTE	-					
COMP	.781**	-				
APP	.644**	.775**	-			
FIT	.762**	.864**	.798**	-		
SOC	.823**	.765**	.709**	.776**	-	

Notes. MPAM-ID = Motives for Physical Activity Measure adapted for youth with Intellectual Disabilities; λ = factor loadings; δ = Uniquenesses; ω = omega coefficient of composite reliability; APP = appearance; COMP = competence; FIT = fitness; SOC = social; INTE = interest/enjoyment. * $p \leq .05$; ** $p \leq .01$

Table 4*Standardized Parameters Estimates from the Exploratory Structural Equation Model of the MPAM-ID*

Items	ITE (λ)	COMP (λ)	APP (λ)	FIT (λ)	SOC (λ)	δ
INTE1	.818	.030	-.001	.005	.041	.248
INTE2	.805	.078	.141	-.088	-.021	.238
INTE3	.534	.045	-.103	.291	.165	.302
COMP1	.074	.469	.064	-.012	.224	.482
COMP2	.273	.508	-.063	.006	-.072	.601
COMP3	-.109	.863	.032	.120	-.057	.236
APP1	.034	.135	.649	-.007	.001	.419
APP2	-.036	-.010	.818	.137	-.038	.252
APP3	.060	-.069	.701	.042	.127	.373
FIT1	.056	.205	.101	.379	.115	.460
FIT2	-.040	.156	.058	.592	.159	.308
FIT3	.100	-.042	.100	.882	-.096	.143
SOC1	-.036	.122	.138	-.123	.649	.484
SOC2	.233	-.002	.173	.077	.435	.396
SOC3	.022	-.047	-.114	.117	.807	.351
ω	.855	.720	.818	.790	.744	

Latent Factor Correlations (Pearson)

INTE	-				
COMP	.637**	-			
APP	.517**	.674**	-		
FIT	.587**	.697**	.639**	-	
SOC	.638**	.598**	.534**	.575**	-

Notes. MPAM-ID = Motives for Physical Activity Measure adapted for youth with Intellectual Disabilities; λ = factor loadings (target loadings are in greyscale); δ = Uniquenesses; ω = omega coefficient of composite reliability; APP = appearance; COMP = competence; FIT = fitness; SOC = social; INTE = interest/enjoyment. * $p \leq .05$; ** $p \leq .01$.

Table 5

Correlations from the Convergent Validity Analyses of the MPAM-ID and Perceived Physical Abilities














MPAM-ID	Perceived Physical Abilities
Interest/enjoyment	.732**
Competence	.522**
Appearance	.520**
Fitness	.372**
Social	.512**

Notes. * $p \leq .05$; ** $p \leq .01$; MPAM-ID = Motives for Physical Activity Measure adapted for youth with Intellectual Disabilities; ω = omega coefficient of composite reliability.

APPENDIX

Items and Response Scales of the English and French Versions of the MPAM-ID

N°	Scales	English items	French items
		I do sport ...	Je fais du sport ...
1	INTE1	Because it is fun	Parce que c'est amusant
2	SOC1	Because I want to be with my friends	Parce que je veux être avec mes ami(e)s
3	INTE2	Because I like to do sports	Parce que j'aime ça
4	COMP1	Because I want to improve my skills	Parce que je veux devenir meilleur(e)
5	COMP2	Because I like to succeed at doing difficult things	Parce que j'aime réussir des choses difficiles
6	APP1	Because I want to have more muscles to look better	Parce que je veux avoir plus de muscles pour être plus beau/belle
7	FIT1	Because I want to have more energy	Parce que je veux avoir plus d'énergie
8	COMP3	Because I want to get better physically	Parce que je veux être meilleur(e) physiquement
9	SOC2	Because I like being with people who love sports	Parce que j'aime être avec des gens qui aiment faire du sport
10	FIT2	Because I want to improve my physical fitness	Parce que je veux être plus en forme physiquement
11	APP2	Because I want to improve my appearance	Parce que je veux être plus beau/belle physiquement
12	FIT3	Because I want to be strong and healthy	Parce que je veux être plus fort(e) et en santé
13	APP3	Because I want to be attractive to others	Parce que je veux que les autres me trouvent plus beau/belle
14	INTE2	Because I have fun when I do sports	Parce que j'ai du plaisir quand j'en fais
15	SOC3	Because I enjoy being with others	Parce que j'aime être avec les autres

Answer scales												
No, I		Sometimes yes/no		Yes, I		Non, je suis		Parfois oui/non		Oui, je suis		
												
Totally disagree	Disagree	In between	Agree	Totally agree	Doesn't understand the statement	Pas du tout d'accord	Pas d'accord	Entre les deux	D'accord	Tout à fait d'accord	Ne comprend pas l'énoncé	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Notes. APP = appearance; COMP = competence; FIT = fitness; SOC = social; INTE = Interest/enjoyment; MPAM-ID = Motives for Physical Activity Measure adapted for youth with Intellectual Disabilities.

Online Supplements for:

A Psychometric Validation of the Motives for Physical Activity Measure for Youth with Intellectual Disabilities (MPAM-ID)

Scale Development

Objectives

The first objective was to examine the appropriateness of the format and clarity of the revised version of the Motives for Physical Activity Measure (MPAM-R) for use among youth with intellectual disabilities (ID), and to select an optimal set of three items per subscale to include in the MPAM-ID. Following this initial verification, the MPAM-R was adapted to increase its clarity and ease of application based on recommendations related to the use of self-report questionnaires among people with ID (Finlay & Lyons, 2001, 2002). Then, a French version of the MPAM-ID was developed following a translation back-translation procedure. This preliminary adaptation was then tested among a first sample of youth with ID, which led to further adaptations. The final adaptation was then tested again among a second sample of youth with ID.

Method

Participants and Procedures

A sample of 34 youth (aged between 13 to 21 years; 35% girls) with mild to moderate-severe ID participated, including 20 English-speaking Australians and 14 French-speaking Canadians. A first subsample of 18 youth ($N = 10$ in Australia and 8 in Canada) was solicited to evaluate the format and clarity of a preliminary adaptation of the MPAM-ID. A second subsample of 16 youth ($N = 10$ in Australia and 6 in Canada) was solicited to assess the format and clarify of the final adapted version the MPAM-ID. The procedures used in this pilot study were identical to those used in the main study and received approval from the same research ethics committees. However, in this pilot process, the MPAM-ID was administered individually, at school, by trained research assistants using a read-aloud assisted procedure to maximise youth's understanding and to facilitate discussion. This administration was mainly focused on assessing the level of understanding of the youth and the ease with which they could respond to the items.

Measures

First, the best three items (i.e., those having the best factor loadings in Ryan et al., 1997) from each subscale of the revised MPAM were selected (i.e., 2, 6-10, 13-17, 19, 20, 22, 30). Second, a preliminary assessment of the appropriateness of the format and clarity of the items was conducted by all members of the research team familiar with the use of self-report questionnaires among youth with ID. Phrase or words that were deemed to be problematic were then maximally simplified or modified while retaining the original meaning. Third, the format and clarity of the original seven-point Likert answer scale (i.e., "Not at all true for me" to "Very true for me") was deemed to be inappropriate by members of the research team familiar with the use of self-report questionnaires among youth with ID. This response scale was thus replaced by a five-point Likert-style graphical response scale (i.e., "Totally disagree" associated with a very unhappy face to "Totally agree" associated with a very happy face). The graphical response scale was inspired by the Wong-Baker facial pain rating scale (Wong & Baker 1988). Additionally, a "do not understand the statement" option was added to the answer scale for situations in which respondents remained unable to understand the item.

Once this process was completed, the adapted English version of the MPAM-ID was translated into French by two members of the research team. This preliminary French version was then back translated into English by two other bilingual members of the research team and compared with the English version. Discrepancies were resolved by adapting the French items. During this process, decisions were taken and discussed by the research team members in committee until a consensus was reached. Additionally, this process was also conducted in collaboration with school personnel (i.e., teachers, psychologists, and physical educators) familiar with youth with ID.

Results

The responses provided by the first subsample of youth revealed that some words used in some of the items were hard to understand for youth with ID (more specifically by those with more severe ID). However, although the new rating scale was well understood by the participants, some did not use the Likert terms and rather responded by a simpler “no” or “yes” to the items. As a result, the problematic items were reformulated and further simplified using suggestions provided by the research assistants involved in the first pilot study. To further increase the clarity of the items, words from all items were associated with pictograms (presented above the words). Likewise, to increase the clarity of the response scale, the different anchor points were revised as follow (in italic and underlined): “No, I totally disagree”, “No, I disagree”, “Sometimes yes/no”, “Yes, I agree”, and “Yes, I totally agree”. Finally, a template comprising a graphical displays and pictograms was developed to explain to the youth how to use the answer scale. This revised version of the MPAM-ID was then administered to the second subsample of youth with ID. Results supported the adequacy of the final English and French versions of the MPAM-ID and their suitability for use as self-report instruments among youth with ID.

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