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INSTRUCTIONAL STRATEGIES OF INCLUSIVE PHYSICAL EDUCATION TEACHERS: DEVELOPMENT AND VALIDATION OF A SELF-DETERMINATION SCALE

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The purpose of the research was to develop and validate the Self-Determination Scale for Physical Education (SDS-PE) to determine the extent to which physical education teachers of students with and without a disability foster self-determination. Wehmeyer's (2007) model of self-determination was used as a guiding framework. The research consisted of two phases. First, evidence based on test contents was established. Second, the internal structure of the scale was investigated via factor analysis and reliability was assessed. Three of the four anticipated subscales emerged: autonomy, psychological empowerment, and self-realization. Internal consistency for the scale and its subscales was acceptable (Nunnally, 1978). Temporal stability values were low to moderate. This instrument has several psychometric strengths but requires additional development and demonstration of its reliability and validity before its use in teacher education and research.

Keywords: *autonomy, scale development, validation, measurement, disability*

SELF-DETERMINATION SCALE

Participation in regular physical activity among youth with a disability is generally lower than that of youth without a disability (Frey, Stanish, & Temple, 2008; Rimmer & Rowland, 2008). A variety of environmental, physical, and psychosocial factors influence outcomes for these individuals. In addition to experiencing many of the same barriers to physical activity as youth without a disability, they also encounter unique barriers such as overprotection (Sharav & Bowman, 1992), inaccessible facilities, and lack of opportunities (Frey et al, 2008). Interventions to improve physical activity outcomes for youth with a disability are typically school-based because these programs are readily accessible and available. For example, peer-tutoring in physical education can increase physical activity levels (Lieberman, 1996).

One way to enhance physical activity for youth with a disability may be to foster the development of self-determination in school-based programs. Self-determination may help individuals acquire greater choice and control over personal physical activity needs (Calzonetti, 2003; Reid, 2003; Reid & Hermo, 1998). To facilitate an understanding of self-determination in education, several definitions have emerged. Wehmeyer's (1996) definition is most frequently cited in the special education literature. He defined self-determination as "acting as the primary causal agent in one's life and making choices and decisions regarding one's quality of life free from undue external influence or interference." (p. 22). This definition guides Wehmeyer's (2007) functional model of self-determination. An act or event is self-determined if the individual's action(s) reflect four essential characteristics: (a) the individual acts autonomously; (b) the behaviours are self-regulated; (c) the person initiates and responds to event(s) in a "psychologically empowered" manner; and (d) the person acts in a self-realizing manner (Wehmeyer, 1996). Autonomy refers to the outcome of the process of individuation and encompasses actions that occur according to personal preferences, interests, and/or abilities. Psychological empowerment refers to achieving perceived or actual control and developing the ability to achieve desired outcomes. Self-regulation is the ability to plan, act, evaluate outcomes, and

revise plans. Self-realization involves using accurate knowledge of personal strengths and limitations to perform in a meaningful way (Wehmeyer, 1999).

Self-determination of individuals with a disability may be enhanced by promoting skills associated with these four interacting essential characteristics which are referred to as component elements of self-determined behavior (Wehmeyer, 2007). Component elements associated with autonomy are choice making, decision-making, and problem-solving. Goal-setting and attainment and self-management skills such as self-monitoring and self-evaluation are representative of self-regulation. Psychological empowerment includes self-advocacy and leadership skills, developing an internal locus of control, and forming positive attributions of efficacy and outcome expectancy. Finally, self-realization involves acquiring self-awareness and self-knowledge. Self-determination is viewed as a dispositional characteristic; as such individuals should be consistently using the component elements and related behaviors to exert control over their lives. For example, a student might make the choice of riding the bus to school rather than walking so they can arrive earlier.

Since physical education may be the primary and perhaps most accessible setting for physical activity among youth with a disability, it is important to consider this setting for fostering self-determination. Wehmeyer (1999) suggests opportunities to practice and learn the skills related to self-determination play a powerful role in its development. Physical education teachers may be able to provide these opportunities for development by employing instructional strategies and creating supportive learning environments (Reid & Hermo, 1998). For example, teachers might foster autonomy by allowing students to make a choice between two pieces of equipment. To incorporate opportunities for the students to become self-regulated, teachers may ask students to set a goal and outline steps to achieving it during a basketball unit. Teachers may help students develop psychological empowerment by creating an environment in which students are encouraged to demonstrate learning or mastery of a skill, rather than attempting to achieve a higher skill level than their peers. To enhance self-realization, a teacher may ask students to list their strengths and weaknesses and describe how it may affect their performance in a dance unit.

The purpose of the research was to develop and validate an instrument, i.e., Self-Determination Scale for Physical Education: SDS-PE) to determine the extent to which physical education teachers' foster self-determination based upon Wehmeyer's (2007) model. Because self-determination is particularly valuable for students with a disability, and these students are in inclusive settings, it is important to assess physical education teacher practices. There are compelling reasons of why a valid and reliable instrument is needed. Since teacher practices are complex, it is useful to reduce a large amount of information of what teachers are doing in physical education to fewer constructs with theoretical utility. Such instrument may ultimately be useful in guiding the development of teacher education programs and physical activity interventions. The latter may be particularly important as interventions are critical to improving physical activity outcomes, yet remain a neglected area of research for youth with a disability.

Several self-determination instruments were identified. This is positive given that the development of these measures is an important aspect of advancing the field's application of self-determination to educational practice (Shogren et al., 2008). Agran, Snow, and Swaner (1999) created a survey to examine teacher use of instructional strategies associated with self-determination. This instrument has been adopted or modified in subsequent studies (e.g., Cho, et al., 2010; Wehmeyer et al., 2000), however, it was judged insufficient for the current study for two reasons. First, evidence to support the validity of the instrument was lacking. Second, the current study aims to assess physical education teachers (rather than special educators) who teach a broader range of levels (e.g., elementary and secondary). While other researchers (Cho, et al., 2010; Wehmeyer et al., 2000) have adapted instruments to suit other populations and levels (i.e., secondary general educators), only reliability coefficients were

reported. Grigal, Newbert, Moon and Graham (2003) also developed a survey to examine teachers' beliefs and use of instructional strategies related to self-determination. Initial factorial validity and reliability of the instrument were demonstrated. However, only four of the questions addressed beliefs about instruction; the other four examined perceptions of self-determination such as familiarity of the construct. Because the research aimed to investigate teacher use of instructional strategies rather than their beliefs, we could not justify adopting this instrument for the current study. Therefore, it was deemed appropriate to develop and validate a new instrument.

The present research consists of two phases. In phase one, the SDS-PE was developed and evidence based on test contents was established. Wehmeyer's (2007) theory of self-determination was chosen as a guiding framework for several reasons. First, the theory is frequently cited in the literature and is therefore well-established. Second, the theory focuses on skills and abilities which lead to self-determination, making it particularly applicable to how teachers may foster it. Third, the language used in the theory is not overly complex. This allowed for survey items which could be more easily written by the authors. In phase two, the internal structure and reliability of the SDS-PE were assessed. It was anticipated that a four-factor scale reflecting each of the characteristics of self-determination would emerge. Further, the scale was expected to demonstrate adequate reliability.

METHOD

Phase 1: SDS-PE Development and Content-Related Evidence of Validity

Development and the establishment of evidence based on test contents of the SDS-PE was conducted by following four steps typically recommended in the psychometric literature (e.g., Yun & Ulrich, 2002). These include (a) define the domain of interest, (b) select a panel of experts, (c) have the experts evaluate the items based on specific criteria, and (d) select appropriate items based on expert feedback.

Step 1: Define the domain of interest.

A comprehensive review of the self-determination and disability literature was conducted. Studies selected met several inclusion criteria. First, the primary purpose of the article was to investigate self-determination and individuals with a disability.. Second, the study addressed self-determination in a special education, physical education, or physical activity context. Finally, all articles were published in peer-reviewed English language journals between 1992 and 2006.

An electronic search was performed among peer-reviewed English language journals published from 1992-2006 using Educational Resources Information Center (ERIC), SPORTDiscus, Google Scholar, and PubMed/MedLine databases. The footnote chasing approach (White, 1994) (in which pertinent studies were identified in the reference list of the chosen articles) was used to ensure all relevant articles were included. Search terms were grouped into three categories. One keyword from each category was included in each search, forming several combinations of entries. The categories were (a) self-determination, self-advocacy, independence, autonomy, (b) disability, special education, (c) physical activity and exercise. The primary author read the titles and abstracts of the articles and omitted any articles that did not meet the inclusion criteria. For example, research situated in the workplace or hospital was excluded, as were articles that concerned adults or the elderly. The search led to the identification of 33 articles. Based on the literature review, a preliminary pool of items which represented the four constructs of self-determination was created. The initial instrument consisted of thirty-four items: seven items of autonomy, 15 for psychological empowerment, seven for self-regulation, and five for self-realization.

Step 2: Select a panel of experts. Names of potential content validation experts were identified. Seven university professors and five physical education teachers agreed to serve as experts for the content validation process. University professionals (who participate in academic teaching, research, and/or community service) resided in North America had at least five years of experience working in adapted physical activity, reported being familiar with the concept of self-determination, and had

experience facilitating adapted physical activity programs for individuals with a disability. Physical education teachers had at least seven years of experience teaching students with disabilities in reverse integrated or inclusive settings in a Canadian province. All teachers reported being at least 'somewhat familiar' with self-determination.

Step 3: Have the experts evaluate the items. Experts were sent a package via e-mail or postal mail which included the proposed instrument, informed consent, role of the content validation expert, and operational definitions of the theoretical constructs. Participants were asked to return their responses and informed consent via e-mail, fax, or regular mail within four weeks of the original mailing. They were asked to: (a) rate the degree of match on a 5-point Likert scale (1=poor, 5=excellent) between the proposed test item and the targeted constructs, (b) provide any feedback regarding the wording of the content items, and (c) give information about personal and/or professional experiences defining them as a content expert.

Step 4: Select appropriate items based on expert feedback. The survey items were modified based on the analyses of the quantitative and qualitative feedback received from the experts. Items receiving less than an average degree of match (3.5/5) to the construct by the experts were discarded, unless the researchers had a compelling reason to retain the item. For example, if the researchers felt the poorly rated item was important to represent the characteristic of self-determination, they discussed how the item could be improved and therefore kept it in the survey. Several new items were added to the remaining items to ensure the characteristics of self-determination were well-represented (DeVellis, 2003). The final version of the instrument (after undergoing the content validation process) included 50 items representing the four constructs of self-determination: 12 items representing autonomy, 15 for psychological empowerment, 17 for self-regulation, and six for self-realization.

SDS-PE. The initial survey consisted of two sections (see Appendix). The first gathered demographic and employment information about the teachers such as age and teaching experience. This information was designed to provide assistance in interpreting responses. For example, classroom teachers who instruct students with more severe disabilities view self-determination instruction as less relevant (Wehmeyer et al., 2000). The second section consisted of 50 items about instructional strategies supportive of self-determination in physical education and reflected the component elements of self-determined behaviour. Teachers were asked to rate the extent to which they provide opportunity for students to practice skills such as choice-making and problem solving. Items were worded both positively and negatively to avoid agreement bias (Nunnally, 1978). A Likert-type scale, ranging from 1 (not at all true for me) to 7 (very true for me) was adopted to discriminate between survey responses (DeVellis, 2003).

Phase 2: SDS-PE Empirical Validity Evidence and Reliability

Two-hundred and sixty six (n=266) male and female physical education teacher specialists from four Canadian provinces responded to the survey. Teachers were elementary and secondary physical education specialists who possessed a bachelor's degree and taught students with and without a disability. More specifically, one-hundred and thirty participants taught at the elementary level, 65 participants were secondary teachers, and 71 taught at both levels. Participants had an average age of 35.9 years (SD = 9.5, range= 23-61 years), 11.4 years (SD = 8.9, range = .5 - 34 years) of teaching experience, and reported an average of 9.7 years (SD = 9.8) working with at least one student with a disability (Table 1).

TABLE 1

Participant Characteristics of the Sample (n= 266)

Characteristic		Total (n)	%
Gender			
	Male	125	47
	Female	141	53
Highest level of Education			
	Bachelor	216	81
	Master	46	17
Special education certificate		19	7
Province			
	Quebec	59	22
	Prince Edward Island	53	20
	New Brunswick	108	40
	Ontario	46	17
Adapted physical activity course		191	72
Teach students with a disability		264	99
	Behavioural	228	86
	Emotional	171	64
	Physical	123	46
	Sensory	132	49
	Learning	245	92
	Coordination	188	71
	Pervasive Developmental Disorder	190	71
	Other	10	3

Data Collection

Ethical approval was obtained from the University Institutional Review Board prior to data collection. The survey was distributed to approximately 1000 elementary, middle, and high school physical education teachers via postal mail, e-mail, or professional conferences. Because physical education is generally inclusive in Canada, it was important to distribute the survey to these teachers (as opposed to adapted physical education specialists). Data were collected in four Canadian provinces: (a) New Brunswick, (b) Prince Edward Island, (c) Ontario, and (d) Quebec. These provinces were chosen because each was hosting a provincial physical education conference at the time of data collection and it was believed recruiting at conferences was an effective way to obtain adequate sample size. Thus, all participants were attendees of their provincial physical education conference.

Since some teachers did not have time to complete the survey at the conference, the primary researcher sent an online version of the survey to teachers who had not yet responded. The survey was sent to participants a second time, two weeks after the first administration, to obtain a measure of temporal stability (Bohrnstedt, 1970).

The overall response rate was 27%. Response rates in each of the four provinces varied greatly primarily due to the method of data collection and size of the teaching conference. For example, in Prince Edward Island, only 55 teachers attended the conference but the coordinator designated time to allow the teachers to complete the survey. Under these circumstances, it was easy to obtain a high response rate. In contrast, while more than 700 teachers attended the Ontario provincial conference, the response rate was low because the survey was placed in a conference registration package and not brought to the immediate attention of participants.

Data analysis

The accuracy of the data was screened for normality by investigating descriptive statistics and data distributional properties of the 50 items. Exploratory factor analysis (EFA) was employed to determine the underlying factor structure and reliability values were assessed. Finally, confirmatory factor analysis (CFA) was used to test the underlying structure indentified via the EFA.

Data screening

The sample was examined to determine whether the data could be pooled. A univariate analysis of variance was conducted to examine whether group means across the survey scores were equivalent. Several steps were taken to assess whether the data obtained were appropriate for factor analysis. Two tests were used to provide support for conducting factor analysis with the sample size. The accuracy of the data was screened for normality by investigating descriptive statistics and data distributional properties of the 50 items. Missing values were replaced by the mean of all other values for that variable because no pattern in responses was apparent. Negatively worded items were reverse-scored to facilitate interpretation (Tabachnick & Fidell, 2001).

Exploratory factor analysis

Factor analysis "can be used to determine what theoretical constructs underlie a given data set and the extent to which these constructs represent the original variables" (Hensen & Roberts, 2006, p. 350). Principal-axis factoring was employed as a factor extraction technique (Henson & Roberts, 2006) however, as suggested by Tabachnick and Fidell (2001), principal component analysis was first used to provide insight into the factor structure. Factors retention was based on theory (i.e., Wehmeyer's framework), eigenvalues > 1 (Kaiser, 1960), and Cattell's (1966) scree test.

Since the oblique rotation (with promax technique) indicted the factors were not correlated (<.3) (Tabachnick & Fidell, 2001) the varimax rotation was used for interpretation. Only loadings with a value of .32 and no cross loadings of .32 or above were retained (Tabachnick & Fidell, 2001). One item was deleted at a time and the analysis was rerun to obtain a simple factor structure.

Reliability

Reliability values were calculated for the overall scale and each of the anticipated subscales to evaluate the consistency of SDS-PE. Cronbach alphas were used to assess the internal consistency of the scale. Test-retest correlation coefficients provided a measure of temporal stability of the instrument over a two-week period.

Confirmatory factor analysis

A confirmatory factor analysis (Bryne, 2006) was performed to determine how well the items fit the theory. CFA is a sophisticated technique typically used in later stages of research to test theory (Tabachnick & Fidell, 2001). However, it was deemed appropriate to investigate the factor structure using CFA because the SDS-PE was created to reflect Wehmeyer's (2007) theoretical framework. Fit statistics were used to determine how well the data fit the model with CFA. Categories of fit indices include (a) absolute fit, (b) model parsimony, and (c) comparative fit (Tabachnick & Fidell, 2001). Indices of absolute fit include Chi Square ($\chi 2$) and the standardized root mean square residual (SRMR). For the Chi Square index, non-significant values indicate no significant differences exist between the implied and obtained variance-covariance matrices indicating good overall fit of the model. SRMR is a discrepancy index with values below .08 indicating a good fit. The model parsimony

category includes the root mean square error of approximation (RMSEA; Steiger, 1990). It estimates the degree model fit in the population. RMSEA suggests a poor fitting model has values of larger than .10. A value of .06 indicates a good fit. Finally, the comparative fit index (CFI; Bentler, 1990) is included among the comparative fit indices. As the name suggests, the index compares the model fit to other possible models. Values greater than .95 indicate a good fitting model.

RESULTS

Data Screening

The univariate analysis of variance indicated no difference between sexes ($p = .86$, $p>.05$), specialists and non-specialists ($p= .53$, $p> .05$) or teachers who took an adapted physical activity course and those who did not ($p= .84$, $p> .05$). Further, no differences were found between teachers who taught students with a disability for 10 or less years and those with more than 10 years of experience ($p= .94$, $p> .05$). Finally, no differences were found between teachers who taught for 11 years or less and those with more than 11 years of experience ($p= .29$, $p>.05$). Because it appeared the teachers responded similarly to the survey, data were pooled for the remainder of the analyses.

Bartlett's (1954) Test of Sphericity value ($\chi 2 = 4439.726$, $df = 1225$, $p = 0.00$) was significant suggesting factor analysis was appropriate. Kaiser-Mayer-Olkin Test (1974) of sampling adequacy was .82 ($p >.05$) provided further support for conducting factor analysis as values of .6 and above are required (Tabachnick & Fidell, 2001). Investigation of kurtosis and skewness values, and probability plots determined five variables (i.e., Q6, 18, 25, 27, 35) were non-normal because each had positive kurtosis indexes greater than 3.2 (Tabachnick & Fidell, 2001). The Kolmogorov-Smirnov test suggested the data were normally distributed ($p> .5$). One item (i.e., Q17) had more than 5% of data missing and upon evaluation was dropped because it was likely unanswered due to poor wording. Six outliers were identified and subsequently deleted. Thus, 260 cases were included in the analysis.

Exploratory Factor Analysis

Principle factors extraction with varimax rotation was performed on the remaining 49 items. The orthogonal rotation was chosen for interpretation because the correlations among the factors were low (i.e., <.3) (Tabachnick & Fidel, 2001). Eigenvalues > 1 (Kaiser, 1960) criterion suggested 14 underlying factors. The items were further evaluated using Cattell's (1996) scree plot which estimated a five-factor solution. Closer examination of the results identified a factor consisting of oppositely worded items only. Thus, the strong correlations between these items reflected an artifactual factor (Spector, Van Katwyk, Brannick, & Chen, 1997). These items (Q7, 10, 19, 20, 26, 33, 36, 41, & 50) were deleted and the analysis was rerun because the factor represented response patterns rather than a meaningful factor.

As indicated by the eigenvalues > 1 (Kaiser, 1960) criterion, the remaining items represented 13 underlying factors. The items were further evaluated using Cattell's (1996) scree plot which may over or underestimate the number of factors (Tabachnick & Fidell, 2001). A four-factor solution was estimated. The three- factor solution, which explained 57% of the variance, was preferred because of difficulty of interpreting the fourth and subsequent factors. Items with loadings lower than .32 or cross loadings of .32 or above were excluded when interpreting factors (Tabachnick & Fidell, 2001). The item "develop an honest view of physical abilities" was deleted because it did not contribute to the conceptual understanding of the factors. Overall, 11 items were retained.

Failure of several items to load on the factors reflects heterogeneity of the items in the SDS-PE. Factor 1, 2, and 3 explained 28%, 15%, and 12% of the variance, respectively. Communality values were low, ranging from .18 to .45 (Stevens, 2002), suggesting low internal stability of factors. Loadings of items on the factors are shown in Table 2.

TABLE 2

Factor Loadings for Exploratory Factor Analysis With Varimax Rotation of Self-Determination Scale of 11-Items

	Psychological			Communalities
Item	Autonomy	Self-Regulation	Empowerment	
1. Express personal preferences	**.59**	.10	.15	.36
4. Involved in decision-making in class	**.69**	.17	.05	.49
12. Set own goals	**.53**	.28	.10	.36
16. Make choices to reflect interests	**.78**	.09	.16	.65
42. Evaluate their own performance	.21	**.61**	.07	.42
45. Administer own skill-related feedback	.19	**.82**	.04	.71
32. Explain their own movement errors	.04	**.47**	.28	.32
48. Self-administer their own rewards	.08	**.39**	.01	.16
24. Point out individual strengths	.15	.03	**.54**	.31
27. Improving their skills via hard work	.01	.12	**.69**	.50
35. Efforts will lead to success	.09	.07	**.65**	.43
% of variance	29.9	14.2	13.1	57.3

Overall, loadings ranged from .82 to .39. The average factor loading of the items associated with each factor was .65 for autonomy, .57 for psychological empowerment, and .63 for self regulation. Comrey and Lee (1992; as cited by Tabacknick & Fidell, 2001) claim loadings larger than .71 are excellent, .63 are very good, .55 are good, .45 are fair, and .32 are poor. The results represent three of the expected constructs of self-determination: autonomy, self-regulation, and psychological empowerment. The fourth construct, self-realization, did not emerge. The stability and replicability of the factors was investigated by dividing the data into two random samples and conducting a factor analysis. The solution gave rise to the a different factor structure as it did on the full data set which suggests the solution is not stable and may not emerge in a new sample (Gorsuch, 1974).

Reliability

The means, standard deviations, internal consistency, and temporal stability of the 11 items which emerged via EFA appear in Table 3.

TABLE 3

Means, Internal Consistency, and Test-Retest Correlations of 11-Items

	Time 1				Time 2				Test-re-test
	Mean	SD	Alpha		Mean	SD	Alpha		
Autonomy	5.4	1.2	.76		5.2	.99	.73		.51
Psychological empowerment	6.0	1.0	.66		5.9	.89	.60		.46
Self-Regulation	4.3	1.3	.68		4.3	1.2	.70		.51
Self-Realization	--	--	--		--	--	--		--

Note. Test-retest values are correlations between the baseline and follow-up during a two-week period.

Results indicated high internal consistency (α = .75) of the overall scale and moderate internal consistency of all subscales on the first (α = .66 - .76) and second (α = .60 - .73) administrations. Internal consistency values were slightly higher for the self-regulation subscale on the second occasion (α = .70) and lower for the other two subscales, autonomy (α = .73) and psychological empowerment (α = .60). Temporal stability of the overall scale was r = .53. Autonomy, psychological empowerment, self-regulation had values of r = .51, r = .46, and .51, respectively. Overall, temporal stability values were low to moderate.

Confirmatory Factor Analysis

Confirmatory factor analysis (Byrne, 2006) was performed through LISREL 8.8 (Jöreskog & Sörbom, 2006) on the 11 SDS-PE items to evaluate the fit of the model. The test of multivariate normality had a value under 2.0 (relative multivariate kurtosis = 1.24) and therefore was assumed to represent a normal distribution (Tabachnick & Fidell, 2001). Maximum likelihood estimation was employed to estimate the model (Byrne, 2006). The first item of each set of measures was fixed to 1.00 for identification, leaving the variances free to be estimated. Support was found for the hypothesized model. Values were: Chi-square = 54.43, df = 41, p = .078, CFI = .98, SRMR = .047, and Root Mean Square Approximation (RMSEA) = .035.

Post-hoc modifications were performed in an attempt to develop a better-fitting and possibly more parsimonious model. The Lagrange Multiplier Tests (modification indices) and Wehmeyer's theoretical framework (2007) were used to guide modifications to the initial model. Several suggestions were provided for additional paths. A path predicting the "set your own goals" question (Q12) from the self-regulation factor was added. This addition made theoretical sense given that goal-setting is one of the component elements of self-determination. This modification improved model fit. Chi-square = .45.55, df =40, p = .25., CFI = .99, SRMR = .045, and Root Mean Square Approximation (RMSEA) = .017. This model was improved from the previously hypothesized model. A subsequent model in which the path from the "explain your own movement errors" question (Q32) was added to psychological empowerment was evaluated. The addition made theoretical sense as having students explain mistakes in their performance may help them enhance performance, thereby improving perceived competence. This model was an even more improved fit with values of: Chi-square = 33.31, df = 39, p = .73, CFI = 1.0, SRMR = .035, and Root Mean Square Approximation (RMSEA) = 0.0 (Figure 3). A power analysis (MacCallum, Browne, & Sugawara, 1996) was conducted to assess model fit based upon RMSEA. Values (all > .81) were acceptable given the sample size. All factor loadings between each indicator and variable were low to moderate (all > .14- .69), with low error variances (all < 1.0). The proportion of explained variance in each indicator was low to moderate (R^2 values ranging from .14 to .69), suggesting the model has low reliability.

DISCUSSION

The present research aimed to develop a scale to measure physical education teachers' use of self-determination strategies and provide evidence of its psychometric properties. Evidence of test content, reliability, and internal (i.e., factorial) validity were investigated.

Evidence supporting the test content of the scale was established using a four-step process (e.g., Yun & Ulrich, 2002). Providing evidence of test content is often neglected in scale development (DeVellis, 2003). The content validation process provided support that the SDS-PE possessed items and a response format that adequately represented the theoretical construct of self-determination.

The exploratory analysis revealed three of the four anticipated constructs: autonomy, psychological empowerment, and self-regulation. The majority of items on the autonomy subscale were designed to reflect this construct, including "express personal preferences", "involved in decision-making processes", and "make choices that reflect interests". It was expected that the item "set their own goals" would be associated with self-

regulation, rather than autonomy. In physical education, goal setting may be perceived as important to students' autonomy, rather than their ability to self-regulate. Autonomy pertains to students' ability to express preferences and act according to interests and abilities. Perhaps teachers encourage goal setting within a class context as a way of allowing students to achieve and persist at a skill of personal interest. For example, students are introduced to a wide variety of skills during elementary school (Côté, Baker, & Abernethy, 2003). Teachers might provide students with opportunities to focus on skills most important to them as a way of exploring preferences and abilities.

The psychological empowerment subscale included" improving skills through hard work", "effort leads to success", and "point out individual strengths". While the first two items were anticipated, the third was not. Psychological empowerment refers to achieving personal control and developing the ability to achieve desires. Acting in a psychologically empowered way requires an accurate view of one's own ability. Thus, it is conceivable teachers are contributing to students' self-perceptions by pointing out their strengths. In fact, given that teachers are encouraged to focus on students strengths, it makes sense teachers would view fostering strengths as a component of psychological empowerment.

Finally, the self-regulation subscale included four items expected to emerge: "evaluate own performance", "administer own skill-related feedback", "self-administer own rewards" and "explain movement errors". These items reflect strategies associated with self-regulation such as self-evaluation and self-reflection.

Two possibilities may explain the absence of self-realization, the fourth subscale. Teachers do not see self-realization as distinct or unique in their teaching, or there were insufficient items to represent this construct to warrant its representation. The later explanation seems particularly plausible as this construct had the fewest number of items (n = 5). Thus, creating additional items may produce a self-realization factor.

Internal consistency was evaluated for the subscales of the 11 items which emerged from the EFA. The 11 items represented three of the anticipated subscales and most internal consistency values were acceptable (Nunnally, 1978) on the first (α = .68-.78) and second (α = .60-.73) administration for each of the three factors. It can be concluded the scales have moderate internal consistency. The alpha values of the second administration of the survey were slightly lower which may suggest teachers' use of self-determination strategies is not stable overtime. In fact, these differences may suggest that the degree to which teachers foster self-determination strategies is dependent on the unit or skills being taught. Future research should investigate how various factors such as class content impacts the extent to which teachers' provide opportunities and implement strategies to enhance self-determination.

Temporal stability provides an indication of the stability of the self-determination construct over time. It is important to point out that previous self-determination scales have demonstrated higher temporal stability values. For example, the Choice-Maker Self-Determination Assessment asks teachers to evaluate students' self-determination. This scale has test-rest values of .8 to .96 on two administrations over a two-week period. While this value does not apply to the current research because it is not a self-report scale, it does show self-determination can be measured consistently over time. Test-retest values of the current scale should be compared to test-retest values of other self-report scales for teachers to determine how well the SDS-PE measures stability of responses over time. However, authors of similar self-report scales did not report test-retest values. The temporal stability of the SDS-PE should be investigated in subsequent studies.

The confirmatory factor analysis provided support for the model that emerged using the exploratory technique. The analysis indicated the item "set your own goals" was important to self-regulation in addition to autonomy, which is supported by Wehmeyer's (2007) theoretical framework. The item "explain movement errors" was unexpectedly, yet logically linked to psychological empowerment.

It is important to consider why the data did not fit the self-determination theory exactly as hypothesized. In other words, why did only three factors represent teacher views, rather than four?

Further, why did only 11-items emerge as relevant to teacher views? A few reasons exist. First, the theory may not apply to fields outside of the initial validation sample. To validate the theory Wehmeyer, Kelchner, & Richards (1996) had 400 adults with intellectual disability respond to a survey which indentified the degree to which individuals acted in a self-determined manner in areas such as family living, finances, and employment. Participants also completed several tasks designed to determine their autonomy, self-regulation, psychological empowerment, and self-realization. Results indicated that individuals who scored higher on self-determination experienced higher levels of personal control over the component elements of self-determination such as problem solving, positive attributions, and self-awareness. Given that the theory was validated with people with an intellectual disability, it may be that teachers distinguish between the characteristics of self-determination differently than predicted by theory. For example, perhaps making students aware of their limitations is not an important aspect of teaching physical education, although it was theoretically important in Wehmeyer's conceptualization of self-realization. Thus, the fact that data did not reflect Wehmeyer's (2007) model, largely developed with adults who have an intellectual disability may not reflect inherent weaknesses in SDS-PE as the theory may apply differently to physical education teachers.

Second, it is possible the items did not accurately reflect the theory. It may be that the items themselves are representative but the four factors did not emerge due to the type of scale chosen. Response options which reflected personal descriptors (i.e., not at all true for me – very true for me) were employed to tap into teachers' behaviours. While these descriptors are appropriate to gain insight into human behaviour, the nature of what physical education teachers teach on a day-to-day basis may be more easily interpreted using a scale which measures frequency (i.e., never-always). For example, an informal comment from several teachers was "this was a tough questionnaire to respond to because I use these strategies, but not all the time". Potentially, teachers may respond to an instrument inquiring about the frequency of their self-determination teaching practices with greater accuracy and ease. Subsequent versions of the survey should adopt these response options.

In summary, the validation process resulted in several important considerations for subsequent versions of the scale. The 11 items represented on the three factors should remain as they appear relevant to teachers' self-determination practices. Items should be added to the fourth sub-scale (i.e., self-realization) to determine if it is part of self-determination as perceived by teachers. In addition, items should also be added to all subscales so that each scale is more fully represented. This step is critical to establishing reliability of the revised scale and increasing stability of its factors. Items should not be changed drastically as they did undergo a content validation process, however, all should be reviewed carefully and modified to ensure they are theoretically and practically relevant, in terms of both content and wording. Finally, it is anticipated that modifying the scale to measure frequency of behaviour (never-sometimes-always), rather than a reflection of self will have a significant impact on the teachers' interpretation of the items and therefore may better tap the important aspects of the theory.

Limitations

The present research has some limitations. First, while the sample size used in the factorial validity analysis is consistent with many researchers (i.e. 5:1 subject to item), a larger sample size would provide more replicable data. Subsequent research should use a larger sample size to gain confidence in the stability of the factor structure (Costello & Osborne, 2005). Second, while males and females and specialists and non-specialists did not appear to differ in their views of self-determination, these results may not be generalizable. The sample was not stratified in each province and may not represent views of all teachers. Similarly, only teachers from four Canadian provinces were surveyed and it is not known if the current validation sample is representative of teachers in other provinces. Self-determination may also be viewed differently across cultures (Wehmeyer, 2007), thus results may not be generalized to other countries. Third, possible bias in self-report cannot be ignored. It is possible teachers

did not accurately represent their use of self-determination strategies. In fact, previous research suggests that while teachers view self-determination strategies as important, they do not necessarily implement them in practice (e.g., Wehmeyer, et al. 2000). Future research must explore if responses on the SDS-PE reflect actual teaching practices.

Conclusion

In conclusion, the SDS-PE has several positive attributes. First, although the SDS-PE is in the early stages of development, it is the only available instrument to measure physical education teachers' self-determination practices from an educational standpoint. It will be useful in investigations of physical education teacher practices for students with and without a disability. Second, the reliability measures of the scale reflect adequate internal consistency and stable measures. Third, its preliminary factorial validity was established via CFA and suggested three factors, although additional analyses are necessary in subsequent studies to confirm a model (Tabachnick & Fidell, 2001). A final positive attribute is that the SDS-PE may also be useful for coaches (i.e., Special Olympics) or instructors in therapeutic settings, provided the proper steps are taken to validate its use. The current version of the SDS-PE has several psychometric strengths but requires additional development and demonstration of its reliability and validity before its use in teacher education and research.

Perspective

This research contributes to the literature addressing instruction in physical education for students with a disability. Once the SDS-PE demonstrates sufficient evidence of validity and reliability, it will provide insight into teacher instruction and will ultimately guide interventions to enhance self-determination. Given that youth with a disability experience less than optimal physical activity levels and experiences in physical education this line of research may be important to enhance student outcomes.

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