Original Article

A comprehensive measure of participation motivation: Examining and validating the Physical Activity and Leisure Motivation Scale (PALMS)

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ABSTRACT

Understanding participation motivation and increasing adherence to physical activity among the general population is crucial for the overall well-being of our society. Existing measures do not adequately capture all the motives people have for engaging in sport and exercise. The purpose of the present study was to validate a comprehensive measure of participation motivation, the Physical Activity and Leisure Motivation Scale (PALMS). This included examining the internal consistency and criterion validity of the PALMS, as well as testing the proposed model of PALMS subscales in a confirmatory factor analysis. A community sample of 202 volunteer participants, 120 males and 82 females, aged 18 to 71 years, was recruited from various organizations, clubs, and leisure centres. The participants represented different forms of physical activity namely, Australian Football League (AFL), gym-based exercise, tae kwon do, tennis, and yoga. Results indicate that the PALMS has a robust factor structure (CMIN/DF = 2.22; NFI = 0.95; CFI = 0.97; RMSEA = 0.078). The PALMS also demonstrated good internal consistency with a Cronbach's alpha (α) of 0.79. The α values for the PALMS subscales ranged from .80 to .99. In terms of criterion validity, Spearman's rho (rs) indicated a strong positive correlation between the REMM and the PALMS (rs = .9). The correlations between each PALMS sub-scale and the corresponding sub-scale on the validated REMM were also high and varied from .76 to .95. The present study supports the reliability and the criterion and construct validity of the PALMS as a measure of participation motivation. **Key words:** PARTICIPATION MOTIVATION, PHYSICAL ACTIVITY, VALIDATION, QUESTIONNAIRE, FACTOR ANALYSIS, SPORT, EXERCISE.

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INTRODUCTION

Modern society is witnessing a sharp decline in individual adherence to physical activity. With the advent and excessive use of technology, people have become content with engaging in sedentary jobs and leisure activities. Despite the well-documented benefits of physical activity (Frederick-Recascino & Morris, 2004; Lloyd-Jones et al., 2010), a large proportion of the population in western countries are physically inactive, which is linked to many major causes of mortality and morbidity, including heart disease, cancer, diabetes, and depression (Armstrong, Bauman, & Davies, 2000; WHO, 2006). Thus, it is imperative to motivate people to undertake more physical activity (Frederick-Recascino & Morris, 2004; Lloyd-Jones et al., 2010).

One of the most prominent factors that stimulate and maintain individuals' participation in physical activity is their motivation. For example, individuals who are intrinsically motivated to participate in a physical activity (e.g., who are motivated by factors, that are about the activity, such as enjoyment or skill development and mastery), tend to participate over a longer period of time, as compared to extrinsically motivated individuals, who engage in a physical activity due to factors that are not related to the activity itself, such as rewards, improved health or looking good (Frederick & Ryan, 1993). Therefore, by determining individuals' motivation for an activity, health professionals can use this knowledge to create awareness that will not only prove beneficial on an individual level, but also help the community by reducing lifestyle-related illnesses. More specifically, equipped with this knowledge, health professionals can develop effective interventions to motivate people to engage in physical activity, thereby increasing physical activity adherence.

Researchers have used different approaches to develop standardized instruments to examine and study participation motives. The first approach to study participation motivation involved examining the theoretical correlates of the different motives for physical activity. Examples of questionnaires developed using this method include the 28-item Sport Motivation Scale (SMS; Fortier, Vallerand, Biere, & Provencher, 1995), the 32-item Exercise Motivation Scale (EMS; Li, 1999), 44-item Exercise Motivation Inventory (EMI; Markland & Hardy, 1993), the 69-item Exercise Motivation Inventory-2 (EMI-2; Markland & Ingledew, 1997); the 23-item Motivation for Physical Activity Measure (MPAM), and the 30-item Motivation for Physical Activity Measure – Revised (MPAM-R; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). It should be noted that the number of subscales on each of these questionnaires differ significantly. For instance, the SMS has seven sub-scales (intrinsic motivation to know, accomplish things, and experience stimulation, external regulation, introjected regulation, identified regulation, and a scale for amotivation); the EMS has eight sub-scales (intrinsic motivation to learn, to accomplish and experience sensation, external regulation, introjected regulation, identified regulation, integrated regulation, and amotivation); the EMI has 12 sub-scales (stress management, weight management, recreation, social recognition, enjoyment, appearance, personal development, affiliation, ill health avoidance, competition, fitness, and health pressures); EMI-2 has 14 sub-scales (stress management, weight management, recreation, social recognition, enjoyment, appearance, personal development, affiliation, ill health avoidance, competition, health pressures, positive health, strength and endurance and nimbleness); the MPAM has 3 sub-scales (interest/enjoyment, competence motivation, and body-related motivation); and the MPAM-R has 5 sub-scales (fitness, appearance, competence, enjoyment, and social). Furthermore, these instruments were developed to assess motives for participation in exercise only, and hence did not cover reasons for sport participation. Thus, although the development of these instruments was informed by theory, they were unable to assess the broad range of participation motives that were identified in research on physical activity.

A second approach to study participation motivation in sport and/or exercise has been atheoretical. This has usually involved an empirical exploration of participation motives. In a pioneering study, Gill, Gross, and

Huddleston (1983) used this approach and asked adolescents the reasons for participation in physical activity, employing open-ended questions. Using the acquired information, Gill et al. (1983) devised the 30-item Participation Motivation Questionnaire (PMQ) by presenting the stated reasons as items preceded by phrases like 'I want to' and 'I like to'. Subsequently, Gill et al. (1983) administered the PMQ to 1,138 adolescents at a multi-sport summer camp. After conducting an exploratory factor analysis (EFA), they found eight factors underlying the PMQ, namely achievement, team (affiliation/social), fitness, energy release, to be with others, skill, friends, and fun. Similarly, a number of researchers have used versions of the PMQ to examine motives for participation in a range of sport and/or exercise domains (Brodkin & Weiss, 1990; Buonamano, Cei, & Mussino, 1995; Gould, Feltz, & Weiss,1985; Kirkby, Kolt, & Liu, 1999; Klint & Weiss, 1987; Kolt et al., 1999; Longhurst & Spink, 1987; Morris & Han, 1991; Morris, Power, & Pappalardo, 1993; Sutherland & Morris, 1997; and Weinberg et al., 2000).

Though the numerous versions of the PMQ have indeed covered a breadth of motives of participation in physical activity, it is evident that the descriptive research on participation motivation has largely been unsystematic. Whereas some researchers have chosen to study motives in a single sport, others have selected a wide range of activities. Often the activities were chosen based on a specific interest or convenience, rather than a conceptually based rationale. Other factors, such as sample size and level of participation, have also varied greatly from one study to another. Another shortcoming of the PMQ approach is that it is not supported by any specific theory of motivation (Frederick-Recascino & Morris, 2004). Furthermore, a stable version of the PMQ has not yet been established that could be used to measure participation motivation in a variety of physical activities, with versions varying from 22 to 50 items and factors derived, representing motives for participation, being as few as four and as many as 14 factors.

Clearly, the existing measures of participation motivation lack the comprehensiveness needed to cater for the different motives for participation that are found in both the sport and exercise domains. For example, Weinberg et al. (2000) reported different factors for competitive sport participants to those identified for non-competitive exercisers. It is possible that a reason for this was the small number of items and factors in their study. Also, the measures do not possess a strong conceptual underpinning that is a prerequisite for understanding motives for participation in any kind of physical activity.

Development of the Recreational Exercise Motivation Measure (REMM)
To address the limitations of previous measures, Rogers and Morris (2003) created a new instrument by incorporating both the theory-based and atheoretical approaches. First, they conducted a qualitative study that involved in-depth, semi-structured interviews with 11 exercise participants (seven females and four males) aged 21 to 50 years (M = 36.1, SD = 11.5), to examine the reasons for participation in non-competitive physical activity (Rogers, Morris, & Moore, 2008). They selected regular exercisers who engaged consistently in physical activity for at least 30-60 minutes every week in the preceding year. They used open-ended questions and asked participants to nominate their goals for exercise and what they felt embodied success in their activities. They used terms such as "success" and "goals" throughout the interview and avoided the terms "motives" or "reasons" for participation. Although these terms are often used interchangeably, they are conceptually distinct. This approach reflected the intention of Rogers et al. (2008) to examine achievement goal theory applied to non-competitive or recreational exercise.

Following the participant interviews, Rogers et al. (2008) identified 13 first-order themes, namely competition/ego, social comparison, appearance, rewards, others' expectations, affiliation/social, fitness, medical, psychological well-being, self-esteem, relaxation/stress release, mastery, and enjoyment. These were further reduced to seven second-order themes, namely competition/ego, extrinsic rewards, social,

physical health, psychological health, mastery, and enjoyment. Although the mastery and competition/ego orientations that emerged from the qualitative study aligned with achievement goal theory, a range of other themes were also generated that lacked theoretical underpinning. These appeared to reflect motives rather than goals. Consequently, Rogers et al. (2008) proposed that the motives of mastery and enjoyment could be grouped into an intrinsic motivation general dimension, while all the other motives were grouped as extrinsic motives. This, therefore, fit neatly into the framework of SDT that could account for the range of motives, which emerged from the qualitative study.

This study by Rogers et al. (2008) had some significant advantages over the previous studies. First, the motives that emerged from the qualitative study fitted a theoretical framework, namely intrinsic-extrinsic motivation, as characterized in the SDT. Second, many of the motives that emerged from the interviews were consistent with the items and factors from previous studies (e.g., Frederick & Ryan, 1993; Morris, Clayton, Power, & Han, 1995; Ryan et al., 1997). Furthermore, although the motives were generated within the recreational exercise domain, they reflected considerable overlap with the items in the PMQ, which was developed in a sport context.

Equipped with the findings from the qualitative study, Rogers et al. (2008) generated 90 items to comprehensively cover the different aspects of each construct. They reduced the number of items to 55 based on the recommendations received from a panel of 16 experts in the field of exercise psychology. To create a valid and reliable measure, they borrowed some items from previous measures (e.g., MPAM, MPAM-R, and the 50-item PMQ). The items from the MPAM and MPAM-R were grouped into 13 integrated concepts and identical items were removed. Then, items that were easily readable and comprehendible were retained while others were deleted. The items from the MPAM and MPAM-R that reflected concepts not covered by the new items were added to the item pool under the relevant integrated concept. Two additional items (one related to gaining status and recognition from sport and the other referred to winning) from the 50-item PMQ that were not covered by the existing items were also added. This resulted in a 73-item questionnaire. Each item was independently reviewed to ensure that the 13 constructs were comprehensively covered and that none of them was over-represented by the items. To reflect the breadth of the constructs, a similar number of items (between four and eight) were used to represent each of the 13 constructs.

The new measure, named the Recreational Exercise Motivation Measure (REMM), asked for the response to each item on a 5-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*), to indicate how people's motives for participation in physical activity agreed (or disagreed) with those expressed in each item. The choice of a 5-point scale was based on the recommendations of several authors (e.g., Clark & Watson, 1995; Comrey, 1988; Kline, 2005). The items were randomly sequenced in the final version of the questionnaire. All the items followed the same stem "I exercise …..". Examples of the items are "to keep up current skill level", "because it makes my physical appearance better than others", and "because it is something I have in common with my friends". The REMM was administered to 82 recreational exercise and recreational sport participants (65 females and 15 males, 2 gender not specified, M = 38.4, SD = 11.1) who were recruited from various gymnasiums and clubs. The REMM has been validated with 750 recreational exercisers (439 females, 238 males, and 73 gender not specified) aged 14 to 84 years (M = 38.5, SD = 13.2; Rogers et al., 2008). A follow up study with 245 sports participants (98 females, 119 males, 28 gender not specified), aged 17 to 74 years (M = 30.7, SD = 7.7), was also conducted that revealed similar factor structure in EFA. An EFA was conducted on both the recreational exercise sample and the recreational sport sample, which revealed an eight-factor structure, namely competition/ego, appearance, others' expectations, affiliation, physical condition, psychological condition, mastery, and enjoyment. The factor structure that emerged was found to be very similar to what was predicted based on the prior qualitative study (Rogers et al., 2008). A

second-order factor analysis was then carried out on the factor scores from the first-order analysis. The second-order factor analysis grouped the eight first-order factors into three broad constructs, namely (with first-order themes in parentheses), intrinsic motivation (mastery, enjoyment), social extrinsic motivation (others' expectations, affiliation, competition), and body/mind extrinsic motivation (physical condition, psychological condition, and appearance). This was in line with the argument that the motives would fit the intrinsic-extrinsic dichotomy, where the motives of mastery and enjoyment would reflect intrinsic motivation while all the others would refer to extrinsic motivation.

The data also revealed that the REMM had reliable internal consistency. The coefficient alpha (α) for the total scale was found to be .94 in the recreational exercise sample, and .92 in the recreational sport sample. The α values for each of the sub-scales were the same for the recreational exercise data and recreational sports data. The α values for each of the sub-scales of REMM were high and varied from .77 and .92, namely (with the corresponding subscale in parentheses) .92 (competition/ego), .83 (appearance), .77 (others' expectation), .90 (affiliation), .80 (physical condition), .85 (psychological condition), .88 (mastery), and .88 (enjoyment). The concurrent validity of the factors in REMM was supported by the fact that most of the items drawn from MPAM-R and the PMQ emerged from the factor analysis into equivalent factors in the REMM. Also, the factor analysis revealed that the REMM covered concepts that were not covered by the MPAM-R or the PMQ.

The study revealed that the exercise participants placed more emphasis on physical condition and appearance, while their sports counterparts rated enjoyment and affiliation as more important. This was in line with previous research (e.g., Frederick, 1991; Frederick & Ryan, 1993; Morris et al., 1995, 1996; and Ryan et al., 1997). For instance, Morris et al. (1995) found that team sport participants placed more emphasis on challenge, fun, and affiliation, while exercise participants rated health/fitness motives to be more important. The consistency of these findings lends further support to the construct validity of the REMM. Future research should explore this area further and examine the different reasons people have for engaging in physical activity to build on the initial construct validity.

Research has clearly outlined the advantages REMM has over the other questionnaires. First, REMM was developed by incorporating both theoretical and atheoretical approaches. Also, the motives that emerged from REMM not only fitted the intrinsic-extrinsic motivation within the SDT, but were also consistent with the items and factors from previous studies (e.g., Frederick & Ryan, 1993; Morris et al., 1995; Ryan et al., 1997). And finally, REMM has been validated with both sport and exercise participants (Rogers et al., 2008).

Development of the Physical Activity and Leisure Motivation Scale (PALMS)
Though the REMM has proven to be a comprehensive measure of participation motives for participation in sport and physical activity, it has some limitations. The sizeable length of the REMM has the potential to create problems, which may affect the results obtained (Morris & Rogers, 2004). For example, the time needed to complete the questionnaire might lead to boredom and fatigue. Hence, the REMM might not always be convenient for administration in sport or exercise contexts.

Consequently, a shorter measure, called the Physical Activity and Leisure Motivation Scale (PALMS), was developed by selecting the five strongest items on each of the eight factors in the REMM, producing a 40-item measure (Morris & Rogers, 2004). The number of items on the REMM, which loaded on each of the eight factors, ranged between eight and 13. To arrive at a short form version of the REMM, Morris and Rogers (2004) conducted item analysis, including examination of means and standard deviations, skewness and kurtosis, factor loadings, item-subscale correlations, and deleted alpha coefficient values. Items with high

factor loadings and correlations were retained. Items with means not located too far toward one or other extreme of the scoring range, moderate to high standard deviations, indicating good spread in the distribution, high factor loadings on the factors they had been assigned to, and high correlation coefficients with the total score for the subscale to which they had been assigned, were retained while others were not included in the shorter version. As a result of this, three items were excluded from the subscales of physical condition, affiliation, others' expectations, and enjoyment, and eight items were left out of the competition/ego subscale. This resulted in the short form of the measure with a total of 40 items (five items on each of the eight subscales). Given that the PALMS has been derived from the REMM, it is plausible that the PALMS, like the REMM, will have sound psychometric properties. A study by Zach, Bar-Eli, Morris, and Rogers (2012) translated the PALMS into Hebrew (PALMS-H) and validated it with 678 recreational exercise participants (350 males, 316 females, and 12 gender not specified) aged 9 to 89 years (*M* = 28.65, *SD* = 16.48) who exercised regularly from 30 different gymnasiums, recreational parks, clubs, and fitness centers in Israel. An EFA of the data yielded nine factors namely, competition/ego, affiliation, psychological condition, appearance, enjoyment, physical condition, mastery, family's and friends' expectations, and health professionals' and employers' expectations. Zach et al. (2012) also found that the PALMS-H demonstrated good internal consistency, with the α values for each of the sub-scales ranging from .63 to .96. More specifically, the α values for each of the sub-scales of the PALMS-H were (with the corresponding subscale in parentheses) .96 (competition/ego), .91 (affiliation), .90 (psychological condition), .90 (appearance), .89 (enjoyment), .84 (physical condition), .84 (mastery), .83 (family's and friends' expectations), and .63 (health professionals' and employers' expectations). The factor structure of the PALMS was found to be very similar to that of the REMM. There was one difference. The factor labeled others' expectations (from the REMM) was found to be split into two separate factors, one that referred to family's and friends' expectations, and another that related to health professionals' and employers' expectations.

Aims of the study

Based on the literature review, the primary purpose of the present study was to validate PALMS. Since previous studies have used EFAs to study the factor structure of both the REMM and the PALMS, a CFA was conducted in the present study to test the factor structure of the PALMS. The PALMS was expected to demonstrate sound psychometric properties. This study also examined the reliability and validity of the PALMS. More specifically, the internal consistency and criterion validity of the PALMS were also investigated in the study. It was expected that the subscales of the PALMS would demonstrate good internal consistency. With respect to the criterion validity, it was expected that the subscales of the PALMS would show strong correlations when compared to the corresponding subscales of the REMM.

MATERIALS AND METHODS

Participants

A community sample of 202 volunteer participants, 120 males and 82 females, aged 18 to 71 years (*M* = 28.7, *SD* = 10.28), was recruited from various organizations, clubs, and leisure centres. The participants represented different forms of physical activity namely, Australian Football League (AFL), gym-based exercise, tae kwon do, tennis, and yoga. Informed consent and institutional ethics approvals were obtained, wherever applicable, prior to data collection.

Measures

Participants who were willing to participate in the study were asked to complete a questionnaire pack which included Demographic Information form, Recreational Exercise Motivation Measure (REMM; Rogers &

Morris, 2003), the Physical Activity and Leisure Motivation Scale (PALMS; Morris & Rogers, 2004) and the Shortened Marlowe Crowne Social Desirability Scale (SM-C-SDS; Reynolds, 1982).

Analyses
Testing the factor structure of the PALMS
In the present study, structural equation modeling (SEM) was used to test the factor structure of the PALMS. Structural equation modeling is a statistical methodology that is used for the quantification and testing of theories and models. There are no operational methods for measuring latent variables, especially in behavioural sciences. Manifestation of these variables can be observed, however, by recording certain behavioural patterns or responses using instruments (e.g., questionnaires, self-reports, and tests). SEM uses path diagrams and analyses to explicitly state the dependency relations between the latent and observed variables in multivariate data. Confirmatory Factor Analysis (CFA) is a part of SEM and plays a crucial role in model validation in path or structural analyses. Each variable included in the path diagram in the CFA is measured by its own set of observed indicators. In the present study, a path diagram was drawn to depict the relationship between the latent variables (8 factors) and the observed variables (items on the PALMS). The assumptions of normality were also checked. A number of fit indices (e.g., CMIN/DF, NFI, CFI, and RMSEA) have been considered to see how well the data fit the model.

Internal consistency and criterion validity of the PALMS
Cronbach's Coefficient Alpha was calculated in order to determine the internal consistency of the items for the whole scale. In terms of criterion validity, each of the eight subscales of the PALMS was correlated using Spearman's Rank Correlation Coefficient with the corresponding subscales on the REMM. The Pearson's Product-Moment correlations between the subscales of the PALMS and the SM-C-SDS were also examined to determine whether participants were responding to the REMM and PALMS in socially desirable ways.

RESULTS

The global means and standard deviations for motivation on the REMM and PALMS in each activity are presented in Table 1. As the results indicate, the means and standard deviations for these physical activities were very similar on the REMM and the PALMS.

Table 1. Means and Standard Deviations for REMM and PALMS for Different Activities

PA	*N*	REMM		PALMS	
		M	*SD*	*M*	*SD*
AFL	42	3.32	0.11	3.45	0.15
Gym	44	3.38	0.19	3.37	0.20
Taekwondo	36	3.29	0.06	3.31	0.06

Tennis	30	3.08	0.07	3.16	0.10
Yoga	36	2.92	0.08	2.96	0.08

Note. PA = physical activity. N = sample size. M = Mean. SD = Standard Deviation.

The means and standard deviations for subscales of the PALMS for males and females are presented in Table 2. An independent samples t-test revealed that there were significant differences in the mean scores for males and females in the subscales of affiliation, appearance, and mastery.

Table 2. Means for Subscales of the PALMS for Males and Females

Subscales	Males	Females
Mastery	19.82*	20.06*
	(3.97)	(4.48)
Enjoyment	19.23	19.18
	(1.78)	(1.89)
Affiliation	17.08**	13.04**
	(6.41)	(3.96)
Competition/ego	18.52	17.13
	(5.30)	(5.54)
Others' expectations	7.83	7.28
	(2.77)	(1.93)

Physical condition	19.62	19.30
	(2.04)	(2.19)
Psychological condition	17.54	17.93
	(2.48)	(2.40)
Appearance	13.83*	16.16*
	(5.42)	(6.40)

Note. Numbers in brackets are standard deviations.

$^*p < .005$, $^{**}p < .001$.

Confirmatory Factor Analysis

A CFA, based on the data collected, was carried out through AMOS 19.0 on the eight subscales of the PALMS. The hypothesized model consisted of eight latent variables, namely Mastery, Physical Condition, Affiliation, Psychological Condition, Appearance, Others' Expectations, Enjoyment, and Competition/Ego. Data from 202 participants, who engaged in a range of physical activities including AFL, gym-based exercise, tae kwon do, tennis, and yoga, was collected. The data was screened for multivariate outliers. There was no missing data. The assumptions of multivariate normality were examined by checking the multivariate skewness and kurtosis coefficients (Tabachnick & Fidell, 2007). There were significant departures from normality for some of the items. Harington (2009) maintained that maximum likelihood (ML), one of the commonly used estimation methods, might not be appropriate in cases of non-normality. Asymptotically distribution-free (ADF) estimation, on the other hand, does not assume multivariate normality and should be preferred (Kline, 2005). ADF, however, requires very large samples to obtain reliable weight matrices (Browne, 1984; McDonald & Ho, 2002). Given the sample of 202 in this study was not sufficiently large, the generalized least squares (GLS) was used as an estimation method.

The fit statistics, namely minimum discrepancy (CMIN or χ^2), degrees of freedom (DF), minimum discrepancy divided by the degrees of freedom (CMIN/DF ratio), normed fit index (NFI), comparative fit index (CFI), and the root mean square error of approximation (RMSEA) are presented in Table 3. Table 3 indicates that, in the present study, the hypothesized model produced a significant chi-square, χ^2 (712, 202) = 1580.334, p < .001. The CMIN/DF or χ^2/df ratio was found to be 2.22. The NFI and CFI were found to be 0.95 and 0.97 respectively. The RMSEA was also considered to assess the degree of fit of the model. The RMSEA value for the hypothesized model was found to be 0.078, with 90% confidence intervals ranging from 0.073 to 0.083.

Table 3. Model Fit Indices for the Data Collected using PALMS

	N	CMIN	DF	CMIN/DF	NFI	CFI	RMSEA	
Model$_H$	202	1580.334	712	2.22	0.951	0.969	0.078	
							0.073[*]	0.083[**]

Note. Model $_H$ = the hypothesized model. N = sample size. CMIN = minimum discrepancy. DF = degrees of freedom. NFI = normed fit index. CFI = comparative fit index. RMSEA = root mean square error of approximation. [*] = lower boundary of a two-sided 90% confidence interval for the population. [**] = upper boundary of a two-sided 90% confidence interval for the population.

Internal Consistency and Criterion Validity of the PALMS

The internal consistency and the criterion validity of the PALMS are represented in Table 4. Overall, the PALMS demonstrated good internal consistency with a Cronbach's alpha (α) of 0.79. The internal consistency values of the eight PALMS subscales were generally high, the lowest being 0.80 for others' expectations. Spearman's rho (r_s) indicated a strong positive correlation between the REMM and the PALMS (r_s = .9, p<.001, two tailed, N = 202). The Spearman's rho correlations between each PALMS sub-scale and the corresponding sub-scale on the validated REMM, which are also displayed in Table 4.5, were also high, ranging from rs = .76 to .95, which lends support to the criterion validity of the eight PALMS subscales.

Table 4. Internal Consistency and Criterion Validity of the PALMS

Sub-scales	PALMS	PALMS & REMM
	Internal consistency (α)	Correlations (r_s)
Mastery	0.97[*]	0.93[*]
Physical condition	0.96[*]	0.76[*]
Affiliation	0.99[*]	0.95[*]
Psychological condition	0.90[*]	0.91[*]
Appearance	0.99[*]	0.89[*]

Others' expectations	0.80*	0.84*
Enjoyment	0.95*	0.83*
Competition/ego	0.98*	0.83*

Note. α = Cronbach's alpha. r_s = Spearman's rho.

* *p = significant at .01 (two-tailed)*

The Pearson's product moment correlation coefficients between each of the subscales of the PALMS and the SM-C-SDS are presented in Table 5. These indicated low correlations between each subscale of the PALMS and the SM-C-SDS. The highest correlations were observed for the competition/ego and physical condition subscales respectively.

Table 5. Correlation between each of the Subscales of the PALMS and the SM-C-SDS

Sub-scales	PALMS & SM-C-SDS
	Pearson's Product-Moment correlations (r)
Mastery	-0.04
Physical condition	-0.30**
Affiliation	0.03
Psychological condition	0.03
Appearance	0.05
Others' expectations	-0.14*
Enjoyment	-0.21**

Competition/ego	-0.34**

* p < .05, ** p < .01.

DISCUSSION

Based on the literature reviewed, the primary aim of the present study was to validate the Physical Activity and Leisure Motivation Scale (PALMS). Since previous research has used EFAs to study the factor structure of both the REMM and the PALMS, a CFA was conducted in the present investigation to test the factor structure of the PALMS. Subsequently, the reliability and criterion validity of the PALMS were also examined.

Testing the Factor Structure of the PALMS
The PALMS was developed from its parent measure, the REMM, to examine motives for participation in physical activity. In the present study, CFA was conducted to examine the 8-factor model of the PALMS that is based on its derivation from the 8-factor REMM. The eight factors of the PALMS are Mastery, Physical Condition, Affiliation, Psychological Condition, Appearance, Others' Expectations, Enjoyment, and Competition/Ego. The CFA was employed to evaluate the extent to which the PALMS measures the latent variables it is proposed to measure. Fit indices were used to examine the model fit and see how well the population data fitted the hypothesized model. In the CFA, the data collected in the present study provided a good approximation to the hypothesized model. The goodness-of-fit indices (e.g., χ^2, χ^2/df ratio, NFI, CFI, and RMSEA) indicated a fair model fit and a good degree of precision. These results, therefore, suggest that the hypothesized model in the present study fitted the data well. No post-hoc modifications were necessary because of the good fit of the data to the hypothesized model.

Overall, the results from the present study lend support to the validation of the PALMS. The fit indices and factor loadings indicate that the PALMS has sound psychometric properties. It can be concluded that future research on participation motivation can use the PALMS to examine and study people's motives for engaging in any form of physical activity, interpreting their responses within the 8-factor framework of subscales.

Internal Consistency and Criterion Validity of the PALMS
The internal consistency of a questionnaire refers to an estimate of how consistently the items of the questionnaire measure a construct obtained from a single administration of a single form of the questionnaire and the measurement of the degree of correlations among all of the questionnaire items (Cohen & Swerdlik, 2005). It is based on the correlations between different items on the same questionnaire and depends on whether the items that propose to measure the same general construct produce similar results. The internal consistency reliability indicates that the items within a subscale would correlate highly with each other. Therefore, when a person scores highly on one of the items in a given subscale, he/she is also likely to score highly on the others items in the same subscale, and vice-versa. The results from the present study indicate that the PALMS demonstrated good internal consistency with a Cronbach's alpha (α) of 0.79. Also, the α-values for each of the subscales of the PALMS were high and ranged from .80 to .99. The overall high internal consistency of the PALMS exemplifies that the test items are homogenous in nature. This means that the items will consistently measure the factors they are expected to measure. It is also known that the reliability of an instrument increases with its length, as does that of its subscales. The PALMS subscales maintained high reliability values despite being shorter than the corresponding subscales in the REMM. Consistent with previous research (Rogers et al., 2008; Zach et al., 2012), this finding indicated high reliability of the PALMS.

Criterion validity refers to how adequately a test score can be used to infer an individual's most probable standing based on a given criterion (Cohen & Swerdlik, 2005). It is based on the correlations between the test scores and the scores on the criterion measure. The validity coefficient is used to examine the accuracy of a measure by comparing it with another established measure. The criterion validity of the PALMS was supported by the finding that Spearman's rho (r_s) indicated a strong positive correlation between the REMM and the PALMS (r_s = 0.90). More importantly, each of the subscales of the PALMS yielded a high correlation coefficient with the corresponding REMM subscale. It should be noted that the PALMS was developed by selecting the five strongest items on each of the eight factors in the REMM. The number of items on the REMM ranged between eight and 13. Given the PALMS was developed from the REMM, it is not surprising to see that each of the PALMS subscales (with five items on each subscale) in the present study yielded a high correlation coefficient when correlated with the corresponding REMM subscales (with items ranging from eight to 13). The high correlation coefficients indicate that the 5 items in each of the eight subscales of the PALMS are just as good predictors of the participation motives as the eight to 13 items of the eight subscales of the REMM. This argues for the strong criterion validity of the PALMS despite having fewer items on each of the eight subscales. It can, therefore, be said that the PALMS is also a valid measure of participation motivation and can be used to examine participation motives people nominate for engaging in any kind of physical activity.

Scope for Future Research
The present study demonstrated the PALMS to be a valid and reliable measure of participation motivation. It is, however, important to continually develop and update the PALMS to arrive at a better and comprehensive understanding of participation motivation. It is, therefore, important for future research to examine the long-term stability of the PALMS. Test-retest reliability must be demonstrated over long periods of time to test the efficacy of the PALMS. Stable measures of participation motivation will be needed to effectively examine pre-test, intervention, and post-test designs. As an established measure of participation motives, the PALMS could be of great value in this domain once its test-retest reliability is well established.

PALMS could also be used to match individuals to particular forms of physical activity based on their principal motives for participation. This would help in promoting adherence, as it should reduce the risk of mismatch between motives for participation and characteristics of particular activities that often leads to rapid drop-outs. This has important implications given there is a steady decline in physical activity participation in Australia and that up to 60% of exercise activity participants have been found to drop out within the first six months after commencing an activity (Australian Bureau of Statistics, 2011). The PALMS could be used over a longer period of time to examine the adherence of participants engaged in a range of sport and exercise activities. Health professionals can use this information to develop effective interventions and promote participation in physical activity. The studies to date have been cross-sectional, which means there is no evidence on the question of whether prescription of type of activity based on participation motives would lead to enhanced adherence. Because retrospective research is affected by self-selection or drop-out, prospective longitudinal research would be valuable to address this issue. In such research, the PALMS would be administered prior to individuals commencing participation in physical activity and adherence would then be monitored and compared for individuals who entered sports that matched their motivational profiles compared to individuals who initiated participation in sports that did not match their motivational profile.

The PALMS has been developed and standardized on participants who predominantly represent the Western culture. Future research could also use the PALMS in a number of different cultural contexts to arrive at global understanding of participation motivation. Future research could translate the PALMS into a number of different languages (e.g., Zach et al., 2012), which might help overcome cultural barriers and understand

participation motivation in different contexts around the world.

Implications for Practice
The present study has a number of important implications for practice. The present study establishes the PALMS to be a comprehensive and reliable measure of participation motivation. The PALMS has a number of advantages when compared to other existing measures of participation motivation. It has been developed using both theoretical and atheoretical approaches and measures a breadth of participation motives. Also, it can be used in both sport and exercise contexts. Further, it is a relatively concise measure, which might help to minimise the effects of boredom and fatigue. The PALMS offers a relatively short, yet wide-ranging instrument to examine participation motives in future research on the reasons why people do physical activity.

PALMS could be used to match individuals to a specific form of physical activity based on their primary motives for participation, thereby optimizing satisfaction and increasing the likelihood of adherence. For instance, individuals with low scores on specific participation motives as measured by a questionnaire can be encouraged to participate in appropriate programs that might help enhance their motivational levels.

CONCLUSION

The present study was conducted to validate the Physical Activity and Leisure Motivation Scale (PALMS). A CFA was conducted to examine whether the PALMS has a sound factor structure. Internal consistency and criterion validity were also investigated to test the psychometric properties of the PALMS. The results of this study provided further support for the reliability and validity of the PALMS. The PALMS was shown to be a comprehensive and reliable measure of participation motivation, with sound internal consistency and criterion validity. The PALMS can be used to extract valuable information that will inform health professionals about the wide range of motives people have for participating in different forms of physical activity. This information can be used to meet the myriad needs and motives people have for engaging in physical activity by diversifying the ways in which participation in physical activity has been promoted, and not just focus on the traditional approach to fulfil health-based motives. Covering a broad range of participation motives, health and exercise professionals will be able to match individuals to specific types of physical activity based on their primary participation motives. This will hopefully encourage people to undertake physical activity, lead to greater adherence to physical activity in the long term, reduce drop-out rates and lifestyle-related illnesses, and enhance overall quality of life.

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