

Validity and Reliability of the Portuguese Version of the Dispositional Flow Scale-2 in Exercise

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VALIDITY AND RELIABILITY OF THE PORTUGUESE VERSION OF THE DISPOSITIONAL FLOW SCALE-2 IN EXERCISE

KEYWORDS: Dispositional flow, Scale adaptation, Construct validity, Exercise.

ABSTRACT: This study aimed to analyze the factorial validity and reliability of the Portuguese version of the Dispositional Flow Scale-2 (DFS-2; Jackson and Eklund, 2002) with a sample of 1437 exercise participants, a population in which flow has not been widely studied. The CFA adjustment indices of the nine-factor first-order structure were acceptable. Both the time transformation and loss of self-consciousness scales presented modest correlations with the remaining flow dimensions. Internal consistency estimates were satisfactory for all flow factors. Except for time transformation, all the dispositional flow scales correlated with perceived competence in and enjoyment of exercise. These findings provide support for the validity and reliability of the Portuguese version of the DFS-2 for measuring flow experiences in exercise. The use of the nine flow factor level scores rather than a single global score is recommended.

Although the benefits of regular physical activity are well known (WHO, 2002), a high percentage of people do not engage in enough physical activity or lead a sedentary lifestyle. According to the most recent Eurobarometer census (Eurobarometer, 2010), about 60% of the European population report that they rarely or never practice sports or physical activity. In Portugal, nearly 40% of the population do not engaged in any kind of physical activity, including bicycling, walking or gardening. Thus, in order to understand and promote healthier lifestyles is important to study the motivational determinants of exercise and physical activity.

The flow concept (Csikszentmihalyi, 1990, 2000) describes the subjective nature of the experience in activities that are intrinsically motivating to the individual. It refers to a positive psychological state in which the person is completely involved in the present moment and absorbed by whatever he or she is doing. While experiencing flow, people become so absorbed in the task, that they lose perception of time, surroundings, and everything that is not related to the task that it is being performed. These activities that enable such a fulfilling experience are self-rewarding by themselves because they provide a sense of pleasure that dismiss the need of other goals or external compensation. For this reason, Csikszentmihalyi (1990) labelled these experiences as autotelic. According to this author, flow emerges from activities in which the individual perceives a challenging and dynamic balance between the demands of the task, and the specific skills to successfully cope with it. Flow is also characterized by (a) merge between consciousness and action which matches to a deep in-

volvement expressed by spontaneity and automaticity in the task, (b) clear goals with the exact notion of what to do next, (c) immediate and unequivocal feedback about the capacity to achieve the goals and progress towards them, (d) deep and focused attention on the task, (e) perception of clear control and mastering of the task or situation with no apparent effort, (f) absence of critical self-evaluation about the self and the performance, and finally (g) a sense of time (and sometimes, spatial) distortion or transformation in which the action takes place (Nakamura and Csikszentmihalyi, 2002). This last aspect possibly depends on the nature of the activity and may not be as universal as the remaining characteristics (Jackson and Marsh, 1996). Overall the nature of flow gives the person an intrinsically rewarding and pleasurable experience, and this sense of pleasure is simultaneously inherent to the experience itself, as it is its product.

Research has shown that flow maintains its characteristics across gender, age and social status (Nakamura and Csikszentmihalyi, 2002), different cultures (Moneta, 2004), and different activities and contexts, namely, work and leisure (e.g., Csikszentmihalyi and LeFevre, 1989; Wan and Chiu, 2006); education and family (e.g., Bassi and Delle Fave, 2006; Fullagar and Mills, 2008); sports (e.g., Jackson, 1992, 1995; López-Torres, Torregrosa and Roca, 2007; Moreno, Cano, González-Cutre, Cervelló and Ruiz, 2009), and exercise (Vlachopoulos, Karageorgis, and Terry, 2000).

Exercise may be a natural opportunity to experience flow, since it usually involves a high balance between challenge and

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competences, clear goals, and immediate feedback on performance. In fact, in a recent study about affective responses to flow, Rogatko (2009) found that physical exercise was the most frequent behavioural choice to self induced high flow states. Given the positive nature of the flow experience it is more likely that people tend to repeat activities that provide a higher frequency of this psychological state (Jackson, Kimiecik, Ford and Marsh, 1998). In addition, flow has been considered as a trigger to intrinsic motivation and pleasure in the activity (Jackson, 2000). Research has shown the importance of intrinsic motivation on autonomous regulation and adherence to behaviour (for a review see Ryan and Deci, 2007). Therefore, it can be argued that flow may be an important factor of exercise adherence. Additionally, flow is per se an indicator of personal well-being (Fortier and Kowal, 2007; Kowal and Fortier, 1999) and could be a mediator and/or moderator of other psychological responses related to exercise.

In sum, in order to understand the impact of physical activity on well-being as well as the psychological factors that contribute to adherence to exercise, it's important to assess the frequency of the flow experience (i.e., dispositional flow) as well as to comprehend which conditions allow its occurrence in the context of exercise.

Based on the definition of the flow dimensions proposed by Csikszentmihalyi (1990, 2000), Jackson and Marsh developed a multidimensional self report measure of the flow state (FSS; Jackson and Marsh, 1996). Later, they constructed an identical measure to assess the typical frequency in which the individual experiences flow states in a specific physical activity, named the *Dispositional Flow Scale* (DFS; Jackson et al. 1998). The DFS assumes that people differ in their predisposition to experience flow. This follows Csikszentmihalyi (1990) suggestion that some people may have certain personal characteristics (e.g., low self-centeredness, greater openness to experience and challenge, or greater ability to focus attention), that enable them to experience flow into a greater extent. The state (FSS) and dispositional (DFS) versions of the flow scale share the same 36 items and measure the nine flow dimensions mentioned above: challenge-skill balance, action-awareness merging, clear goals; unambiguous feedback, total concentration on the task at hand, sense of control, loss of evaluative self-consciousness, time transformation and autotelic experience.

Several studies tested the factorial structure of FSS and DFS in sport samples (e.g., Jackson and Marsh, 1996; Marsh and Jackson, 1999). In these early studies, confirmatory factorial analyses have shown an acceptable adjustment to both a nine-first-order factor model in which the factors are inter-correlated, and to a higher order model with a global Flow factor. However, Jackson and Eklund (2002) recognized some limitations of these original versions of the scales, namely the weak correlations between the loss of self-consciousness and time transformation scales with the remaining dimensions of flow. The fragilities of these two sub-scales, also evident by the low factor loadings on the second order factor, led the authors to rephrase five items (three from these two factors), resulting in a new version of the flow scales (DFS-2 and FSS-2; Jackson and Eklund, 2002, 2004). Their results provided support for state and trait versions and both structural models of the scales, despite the consistent superiority of the first order model. Recently, Jackson, Martin and Eklund (2008) cross-validated these new versions (DFS-2 and FSS-2) in a sample of several sport and exercise activities. Results confirmed the factorial structure of the scales.

The initial and more recent versions of these instruments have been adapted to different languages showing that its factor structure is fairly invariable across cultures (e.g., Fournier, Gaudreau, Demontrond-Behr, Visioli, Forest and Jackson, 2007; Kawabata, Mallett and Jackson, 2008). A Portuguese FSS version has also been validated in an elite athlete's sample (Gouveia, Marques and Vieira, 2008). Despite the overall satisfying results, the Portuguese version presents weak results in two scales, similar to the earlier studies (Jackson and Marsh, 1996; Marsh and Jackson, 1999).

Despite these latter results some authors had suggested the existence of cultural differences on both the type of activities and conditions in which flow may emerge (Asakawa, 2004; Bassi and Delle Fave, 2004). This is why it is of relevance to study this concept and the adaptation of flow measures in different cultural contexts and within multiple activities (Kawabata et al., 2008; Moneta, 2004).

Most validation studies of the flow questionnaires have been conducted within athletes' samples. To our knowledge, the only research strictly in the exercise domain was conducted by Vlachopoulos et al. (2000), using the state version (FSS) on aerobics. As in the earlier studies of Jackson and Marsh (1996), the authors found more support for the nine-factor than for the hierarchical model. This led Vlachopoulos et al. to suggest that this flow measure may not be suitable to evaluate other participants than athletes. In response to these critics, Jackson et al. conducted the validation studies of the more recent version of the flow scales with samples that include a greater percentage of physical activity participants from different modalities (e.g., 12% yoga, aerobics, weight training, walking and martial arts and 17% dance in Jackson and Eklund, 2002 studies, or 45% non-competitive sport in Jackson et al., 2008). Their results suggest that DFS-2 and FSS-2 are suitable for physical activity in general. Nevertheless, given the preponderance of athletes in these studies, it is important to investigate the adequacy of these measures in a predominantly exercise sample. By exercise, we mean a non-competitive physical activity in which the primary goal generally focuses on health, well-being and/or fitness (Caspersen, Powell and Christenson, 1985).

The main purpose of this study is to examine the factorial validity and reliability of the Portuguese version of the DFS-2 on a sample of participants that are engaged in a variety of physical activities such as meditative movement exercise (e.g., yoga or tai-chi; Larkey, Jahnke, Etnier and Gonzalez, 2009), martial arts (e.g., aikido or shorinji kempo), and traditional cardio-fitness and group exercises. Additionally we will provide evidence for between-network construct validity of the Portuguese DFS-2 by examining its relationship with two motivational variables that the literature posits as being positively linked to the flow construct: perceived competence (McAuley, Wraith and Duncan, 1991) and enjoyment for exercise (Markland and Ingledew, 1997; Jackson et al., 1998; Jackson, Thomas, Marsh and Smethurst, 2001; Kowal and Fortier, 1999; 2000).

Method

Participants

Respondents were 1437 exercise participants, aged 16 to 80 years ($M = 35.80 \pm 14.21$), 906 women (63%) and 529 men (37%). They practice four main exercise activities: meditative movement exercise (namely Hatha and Sámkhya yoga, Tai-chi

and Qigong) (49%), martial arts (Aikido, Taekwondo and Shorinji Kempo) (20 %), cardio-fitness and group exercise (31%). The most cited exercise frequency was 2 days per week [1-7 days], and 60 minutes per session [20min - 8 hours/day (i.e. exercise instructor)]. The experience on the specific activity varied considerably, from 3 months to 42 years ($M = 42.4$ months i.e., 3.5 years, ± 63.5 months i.e., 5.3 years). Only 8% of the total convenience sample was involved in some level of martial arts competition.

Instruments

Dispositional Flow Scale. The DFS-2 (Jackson and Eklund, 2002; 2004) measures the individual tendency to experience flow during physical activity. It comprehends 36 items (4 for each subscale) designed to evaluate the nine flow dimensions: challenge-skill balance: "I am challenged, but I believe my skills will allow me to meet the challenge"; action-awareness merging: "I make the correct movements without thinking about trying to do so"; clear goals: "I know clearly what I want to do"; unambiguous feedback: "It is really clear to me how my performance is going"; concentration on task: "My attention is focused entirely on what I am doing"; sense of control: "I have a sense of control over what I am doing"; loss of self-consciousness "I am not concerned with what others may be thinking of me"; time transformation: "The way time passes seems to be different from normal"; and autotelic experience: "I really enjoy the experience". Participants are asked to think about how often they experience the characteristic described in each item while practicing a specific exercise and to rate their response in a 5-point Likert scale (1 = Never, 5 = Always). Scores for each dimension result from the mean score of respective items. A total scale score can also be obtained by averaging the scores across all the dimensions. High values correspond to a stronger likelihood for experience flow during that activity or exercise.

Perceived competence. A Portuguese version (Fonseca and Brito 2001) of the perceived competence subscale of the *Intrinsic Motivation Inventory* (IMI; McAuley, Duncan and Tammen, 1989) was used with items rephrased to reflect the specific exercise done by each participant (McAuley, Wraith and Duncan, 1991). The four items (e.g., "I am pretty good at [the actual physical activity]") were scored on a 5 point Likert scale. Scale scores were obtained by averaging the items scores of each participant. High scores indicate that the person feel competent in the physical activity. Both McAuley et al. (1991) and Fonseca and Brito (2001) reported acceptable psychometric properties of this scale with Cronbach's alpha reliability coefficients of .83 and .70 respectively. Similar values were obtained in this study (Cronbach's alpha = .81).

Enjoyment in exercise. Enjoyment was measured with a subscale retrieved from the revised *Exercise Motivations Inventory* (EMI-2; Markland and Ingledew, 1997; Pereira, 2006). Respondents are required to indicate in a 6 point rating scale whether or not each statement is true for them personally (0 = not at all true for me; 5 = very true for me). High scores (resulting from averaging responses to the four items of the scale) indicate that the individual experiences higher enjoyment in exercise (McAuley et al., 1989, 1991). The authors reported very good internal consistency for this subscale of the EMI-2 (Cronbach's $\alpha = .90$). We also found good α reliability coefficients for this scale (.80).

Procedure

The large majority of participants were from Lisbon (Portugal) and from different health clubs and other fitness centers, yoga classes, thai-chi schools and martial arts dojos. They were contacted through the respective federations or class instructors from whom the research team required permission to collect data. Participants were approached by a member of the research team before or after the class and invited to participate in a study. It was explained that the study aimed to learn about participant's habitual thoughts and feelings while practicing a certain physical activity. A package containing the questionnaires (counterbalanced order) and the inform consent form as well as specific filling instructions was then distributed to the individuals that were willing to participate. These filling instructions mentioned that the questionnaires could be filled at any time except immediately after the exercise class. Respondents were asked to identify their main physical activity and to fill the questionnaire based on their usual experience during the selected activity. Completed questionnaires were collected at the moment, dropped in a collection box at the local reception or returned by prepaid mail to the lead researcher. The mean response rate was 61% (from 22% to 100% between different contexts). Twelve questionnaires were discarded for incomplete data. Missing values (< 5% of the data), when less than 3 per respondent, were substituted for respective means.

Data analyses were performed using the statistical software SPSS v.15 and 18, and AMOS v.17 (Arbuckle, 2005).

Cross-cultural translation of the DFS-2. The 36 original items of the DFS-2 (Jackson and Eklund, 2002, 2004) was translated into Portuguese by three Portuguese sport and exercise psychologists, knowledgeable in Flow theory and fluent in English language. The Portuguese version was later translated back to English by a bilingual psychologist to ensure the accuracy of the translation. A consensual wording of the items was obtained by a committee of four experts that included two of the authors of this article, and later tested in a sport coach and three exercise participants. Changes in wording were made whenever necessary in order to make the items more accurate to respondents.

Results

Descriptive statistics and internal consistency of the DFS-2

Responses ranged from 1 to 5 on each of the 36 items. The exception was item 18 (autotelic) that presented a minimum value of 2. The univariate skewness values of the DFS-2 items ranged from .27 to -1.37 (skewness across 36 items = $.06 \pm .07$). The univariate kurtosis values ranged from 3.37 to -1.08 (kurtosis across 36 items = $.48 \pm .13$). These results show that the majority of the items responses are normally distributed, with the exception of two autotelic items (9 and 27) that exhibit high kurtosis values (3.37 and 2.18 respectively).

The means, standard deviations, minimum and maximum as well as the Cronbach's alphas for each of the DFS-2 scales in this Portuguese sample are presented in Table 1. The alpha values obtained in the original studies of the DFS-2 (Jackson and Eklund, 2002) are also presented to allow comparison.

Internal consistency estimates were satisfactory and all above .80 except for the concentration scale (.74). These values are similar to the ones found for the original DFS-2 scale (Jackson and Eklund, 2002) although slightly inferior for the concentration

scale. This result comes from the poor inter-item and item-total correlation of item 14 (.16). When this item was excluded from the analysis, the reliability of the scale increased to .87. All other items contributed satisfactorily for the good internal consistency

of each specific dimension. The autotelic scale exhibited the highest mean values (4.74) and smallest standard deviation (.55). Contrarily, loss of self-consciousness presented a standard deviation of 1.16 and the smallest mean value (3.38).

Scale	Min-Max	Mean	SD	Portuguese version	Jackson and Eklund, 2002	
				α	1	2
Challenge-skill balance	1-5	3.58	.65	.81	.85	.78
Action-awareness merging	1-5	3.26	.75	.83	.82	.86
Clear goals	1-5	3.93	.66	.84	.85	.82
Concentration	1-5	3.65	.63	.74	.84	.80
Sense control	1-5	3.54	.66	.86	.86	.81
Unambiguous feedback	1.25-5	3.48	.63	.85	.90	.86
Loss self-consciousness	1-5	3.38	1.16	.91	.88	.84
Time transformation	1-5	3.41	.76	.80	.81	.82
Autotelic experience	1.75-5	4.54	.55	.87	.85	.79

Table 1. Descriptives and coefficient alphas for the Portuguese version of the DFS-2 sub-scales and the original studies by Jackson and Eklund (2002).

Note. 1 = Jackson and Eklund (2002) study 1; 2 = Jackson and Eklund (2002) study, 2.

Factorial Validity of the DFS-2

The DFS-2 factor structure was investigated by conducting a Confirmatory factor analysis (CFA; Arbuckle, 2005) using maximum likelihood (ML) estimation method. The following goodness of fit indices was used to determine the adequacy of the model: Comparative Fit Index (CFI; Bentler, 1990), Nonnormed Fit Index (NNFI; Bentler and Bonett, 1980), Root-Mean Square Error of Approximation (RMSEA; Steiger, 1990), Standardized Root Mean Square Residual (SRMR) and χ^2 statistics. CFI and NNFI values at or greater than .90 and .95 indicate a reasonable and excellent adequacy of the measurement model (Hu and Bentler, 1999). RMSEA values of .05 or less indicate a close fit (Browne and Cudeck, 1993). SRMR is recommended as an absolute fit index, with values close to .08 and .05 being considered as a reasonable and a good fit (Hu and Bentler, 1999). The χ^2 test, that assesses the magnitude of discrepancy between the hypothesized covariance matrix and the sample covariance matrix, is considered a conservative estimate of model fit, when the sample size is large (Byrne, 2001). Results less than five for χ^2/df are considered to be adequate (Marsh and Hocevar, 1985). The multivariate normal distributions of the responses were examined by means of the standardized Mardia's (1974) coefficient and multivariate kurtosis was observed (*Kurtosis/c.r.* = 2.76). Nevertheless, the ML estimation method is robust even in the presence of a non-normal distribution of the data (Marôco, 2010).

Results of the CFA goodness of fit indices revealed a satisfactory fit to the data of a model consisting of nine first-order inter-correlated factors (χ^2/df = 3.38; CFI = .95; NNFI = .95; SRMR = .05; RMSEA = .040, p = 1.000, 90% CI [.038, .040]).

All items loaded significantly on their respective first-order factor ranging from .47 (time item) to .90 (consciousness) (M = .77). The exception was item 14 (concentration factor) that presented a low loading value (.18, $p \leq .001$). However, the model have covariances/correlated errors between items 21 and 30 (.39) of the clear goals scale and items 35 and 38 (.37) of the time transformation factor. Lagrange Modification Indices ($LMI > 11$; $p < .001$) show that item 14 and 35 present correlated errors and significant trajectories with the action-awareness merging (.31) and the autotelic (.36) scales, respectively.

The estimated correlations among the first-order factors ranged from .09 (autotelic experience and loss of self-consciousness) to .88 (sense of control and unambiguous feedback) and were all significant ($p \leq .001$). The exceptions were the time transformation scale with sense of control and unambiguous feedback (.06 and .05, $p > .05$, respectively). Time transformation and loss of self-consciousness's scales showed the smallest correlations with the other flow factors (ranging from .05 to .31, Median = .13 and .18, respectively for the two scales).

Dispositional flow correlates

The validity of the Portuguese DFS-2 was further investigated by considering the correlations between the DFS-2 scales and the following two motivation dimensions: perceived competence (McAuley et al., 1991) and enjoyment in exercise (Markland and Ingledew, 1997). Table 2 shows that, all flow dimensions significantly correlated ($p < .01$) with perceived competence and enjoyment, with the exception of perceived competence and time transformation (r = .02).

Scale	F1	F2	F3	F4	F5	F6	F7	F8	F9	M1
F1.Chall-skill balance										
F2.Act-awareness merging	.69									
F3.Clear goals	.63	.56								
F4.Concentration	.47	.32	.54							
F5.Sense of control	.78	.68	.72	.61						
F6.Unambiguous feedback	.83	.71	.75	.52	.88					
F7.Loss self-consciousness	.22	.20	.16	.11	.20	.18				
F8. Time transformation	.13	.14	.10	.14	.06°	.05°	.18			
F9.Autotelic experience	.34	.14	.35	.47	.27	.24	.09	.31		
M1. Enjoyment	.28	.20	.18	.18	.25	.24	.07	.18	.32	
M2. P. Competence	.64	.54	.45	.36	.60	.66	.13	.02°	.15	.29

Table 2. Correlations among the Portuguese DFS-2 nine first-order latent factors from the CFA analysis and Pearson correlations with the external variables.

Note. All correlations are significant at $p < .01$ level, with the following exceptions: (°) – not significant ($p > .05$).

Discussion

This paper aimed to analyse the factorial structure and the internal consistency of the Portuguese version of the DFS-2 in a sample of exercise and martial arts participants. Globally, we found sufficient support for the validity of DFS-2 in exercise. Results have confirmed a nine-factor first-order model. These results are compatible with other studies testing the flow scales (Jackson and Eklund, 2002, 2004; Marsh and Jackson, 1999; Vlachopoulos et al., 2000). The apparent weaker values of the χ^2 for the model in our sample, compared with the above mentioned studies, can be related to the sample magnitude.

Given the weaker correlations with the other flow dimensions, time-transformation and loss of self-consciousness factors may not be core aspects of dispositional flow, at least for some exercise participants. These results are consistent with other research studies in physical activity. For example, these two dimensions were the least reported on the qualitative study of flow experience conducted by Jackson (1992, 1995) with athletes. Other studies testing hierarchical models of the trait and state versions of flow scales also confirmed the weaker loadings of one or both of these subscales on the global flow factor (Fournier et al., 2007; Gouveia et al., 2008; Jackson and Eklund, 2002; Jackson and Marsh, 1996; Vlachopoulos et al., 2000), suggesting that there are differences, both among individuals and activities, in the way flow is experienced in the physical activity context.

Item loadings were statistically significant and relatively high. The exception was item 14 “It is no effort to keep my mind on what is happening” (concentration). In fact, this item has already shown the same fragile results in previous studies (e.g., Kawabata et al., 2008; Gouveia et al., 2008). One explanation may be the reference in the item to the participant’s lack of effort to focus attention on the task. That may be perceived as incoherent to a physical activity practitioner, since high focus of attention at the moment and in what is being done (awareness) is frequently valued and reinforced by yoga, tai-chi or martial arts trainers, an important group of our sample. Consequently, a positive answer may be perceived for some as a “bad” answer. Another possible explanation is the fact that the response to this item might be dependent on the participant’s level of competence to perform the task, as well as the level of automaticity allowed by the task. A

new formulation such as “My mind can focus easily in what I’m doing without much effort” can be a valid alternative, since this item has already presented higher factorial consistency in the exploratory work made with the Portuguese state version (Gouveia et al., 2008). Another problematic item was “I lose my normal awareness of time”. This time transformation item revealed to share common variance with several other factors and items, mainly with the autotelic dimension. Future studies should explore other wording for these two items, in order to make them more valid.

Internal consistency of each subscale ranged between adequate to very good. We have found values comparable in magnitude to Jackson and Eklund (2002, 2004) studies. Interestingly, time transformation and loss of self-consciousness scales are strongly consistent factors. This shows that we are measuring a specific reality that maybe important for some groups or activities. Thus, future studies should further explore the relevance of these two scales for the overall factor structure of flow.

Several studies have already demonstrated that perceived sport ability and intrinsic motivation are important correlates of state and dispositional flow (Jackson et al., 1998, 2001; Jackson and Roberts, 1992; Kowal and Fortier, 1999, 2000; Moreno et al., 2009). At the same time, as an autotelic state, flow is an enjoyable experience (Csikszentmihalyi, 1990; Jackson, 2000). For this reason we used similar constructs to further test the construct validity of the *Portuguese Dispositional Flow Scale-2*. As expected, perceived competence (McAuley et al., 1991) and enjoyment for exercise (Markland and Ingledew, 1997) showed positive significant relations with all flow dimensions, with the exception of perceived competence and time transformation which were not inter-correlated. Perceived competence showed to be a moderate correlate of almost all of the flow subscales. Enjoyment for exercise, on the other hand, presented modest but significant correlations with all dimensions. Once again, time transformation and loss of self-consciousness presented the smallest correlations with both external variables. Overall, these results support the relations between competence and flow experience, not only in the sports context but also in exercise. According to the flow model, the experience of this optimal state, results from a challenge balance between high competences and task demands (Csikszentmihalyi, 1990). An exerciser confident

in his/her abilities will not only be willing to increase the challenge and the difficulty of the task (i.e., high challenge-skill balance), but also to perceive him/her self as more capable of achieving success in it (i.e., unambiguous feedback about the way the performance is going). Our data may support this claim since perceived competence showed the highest correlations with the challenge-skill balance and unambiguous feedback flow scales. The causal direction proposed by the flow model must be confirmed in future studies. As expected, the autotelic experience and challenge-skill balance were the most important correlates of enjoyment in exercise. Its modest correlations with the remaining flow scales show that enjoyment is an independent construct from flow.

Due to time transformation and loss of self-consciousness modest relations with the other flow scales as well as with the external criteria, there was no sufficient statistical support to test the validity of a hierarchical flow model. Globally, our results suggest that it is more appropriate for the Portuguese DFS-2 version, to use the nine proposed dimensions rather than calculating an overall flow factor. This is the recommended procedure, even

though the use of a global flow factor could be useful in some circumstances (Jackson and Eklund, 2002; Jackson and Marsh, 1996; Marsh and Jackson, 1999).

The validation of a scale is an ongoing process. Future studies should also evaluate other psychometric properties, namely, the temporal stability of this scale. To our knowledge only one study presented test-retest data (Kawabata et al, 2008), and it was conducted within a Japanese sample. The analysis of concurrent and predictive validity should also be studied, by investigating the relationship of DFS-2 with other motivational dimensions (e.g., self-determination, self-efficacy and exercise persistence).

As previously stressed by several authors (e.g., Fournier et al., 2007), the confirmation of the DFS-2 factorial structure in different languages reinforces the validity of the Dispositional Flow construct and simultaneously contributes to the external validity of this variable. The DFS-2 is a strong tool to study differences among individuals and physical activities in their typical frequency of flow. Moreover, its use may allow the understanding of the role of this variable as a potential mediator and/or moderator of the effects of physical activity in well being.

VALIDAD Y FIABILIDAD DE LA VERSIÓN PORTUGUESA DE LA ESCALA DE FLOW DISPOSICIONAL-2 EN EJERCICIO

PALABRAS CLAVE: Flow disposicional, Adaptación de instrumentos, Validez de constructo, ejercicio.

RESUMEN: El objetivo del presente estudio ha sido analizar la validez y fiabilidad de la versión portuguesa de la *Escala de Flow Disposicional-2* (DFS-2; Jackson y Eklund, 2002) en una muestra de 1437 practicantes de ejercicio, una población en que el flow ha sido menos estudiado. Los AFC revelaron índices de ajuste aceptables para un modelo de 9 factores interrelacionados. Las escalas de transformación del tiempo y de pérdida de auto-conciencia tienen correlaciones modestas con las restantes dimensiones de flow. Todos los factores presentan valores satisfactorios de consistencia interna. A excepción de la escala de transformación del tiempo, la percepción de competencia y placer/satisfacción para el ejercicio se correlacionan significativamente con todas las escalas del flow. Los resultados apoyan la validez y fiabilidad de la versión portuguesa de la DFS-2 para evaluar la experiencia de flow en el ejercicio. Se recomienda el uso de los nueve factores del flow.

VALIDADE E FIABILIDADE DA VERSÃO PORTUGUESA DA DISPOSICIONAL FLOW SCALE-2 NO EXERCÍCIO

PALAVRAS CHAVE: Flow disposicional, Adaptação de escalas, Validade de constructo, Exercício.

RESUMO: O objectivo deste estudo foi analisar a validade factorial e a consistência interna da versão Portuguesa da *Dispositional Flow Scale-2* (DFS-2; Jackson & Eklund, 2002) numa amostra de 1437 praticantes de exercício, uma população onde o flow tem sido menos estudado. Resultados da AFC revelaram índices de ajustamento aceitáveis para um modelo primeira ordem, com 9-factores inter-relacionados. As escalas transformação do tempo e perda de auto-consciência relacionam-se modestamente com as restantes dimensões de flow. Os valores de consistência interna foram satisfatórios para todos os factores. Com a excepção da escala de transformação do tempo, a percepção competência e prazer/gosto para o exercício correlacionaram-se significativamente com todas as escalas do flow. Estes resultados suportam a validade e fiabilidade da versão Portuguesa da DFS-2 para medir a experiência de flow no exercício. Recomenda-se a utilização dos nove factores de flow.

References

- Arbuckle, J. (2005). *Amos 6.0 User's guide*. Chicago, IL: SPSS, Inc.
- Asakawa, K. (2004). Flow experience and autotelic personality in Japanese college students: How do they experience challenges in daily life. *Journal of Happiness Studies*, 5, 123-154.
- Bassi, M. and Fave, A. D. (2004). Adolescence and the changing context of optimal experience in time: Italy 1986-2000. *Journal of Happiness Studies*, 5, 155-179.
- Bassi, M. and Fave, A. D. (2006). The daily experience of Italian adolescents in family interactions: gender and developmental issues. In A. D. Fave (Ed.) *Dimensions of well-being: Research and intervention* (pp.172-190). Milano: Franco Angeli.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107, 238-246.
- Bentler, P. M. and Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606.
- Browne, M. W. and Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen and J. S. Long (Eds.). *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage.
- Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Caspersen, C. J., Powell, K. E. and Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, 100(2), 126-131.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

- Csikszentmihalyi, M. (2000). *Beyond boredom and anxiety: Experiencing Flow in Work and Play*. San Francisco: Jossey-Bass. (Original work published in 1975)
- Csikszentmihalyi, M. and LeFevre, J. (1989). Optimal experience in work and leisure. *Journal of Personality and Social Psychology*, 56, 815-822.
- Eurobarometer (2010). *Sport and physical activity*. Special Eurobarometer 334/ Wave 72.3. Brussels: TNS Opinion & Social.
- Fonseca, A. M. and Brito, A. P. (2001). Propriedades psicométricas da versão portuguesa do *Intrinsic Motivation Inventory* (IMI) em contextos de atividade física e desportiva. *Análise Psicológica*, 19(1), 59-76.
- Fournier, J., Gaudreau, P., Demontrond-Behr, P., Visioli, J., Forest, J. and Jackson, S. A. (2007). French translation of the flow state scale-2: Factor structure, cross-cultural invariance, and associations with goal attainment. *Psychology of Sport and Exercise*, 8, 897-916.
- Fortier, M. S. and Kowal, J. (2007). The flow state and physical activity behavior change as motivational outcomes: A self determination theory perspective. In M. S. Hagger, & N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 113-125). Champaign, IL: Human Kinetics.
- Fullagar, C. J. and Mills, M. J. (2008). Motivation and Flow: Toward an Understanding of the Dynamics of the Relation in Architecture Students. *Journal of Psychology*, 142(5), 533-553.
- Gouveia, M. J., Marques, M. and Vieira, J. (2008). Estudo confirmatório da estrutura interna da versão portuguesa do Flow State Scale. In *Libro de Resúmenes del VI Congreso Hispano-Luso de Psicología del Deporte, 2-4 Octubre 2008* (pp. 117-128). Cáceres: Consejo Oficial de Psicólogos de Extremadura.
- Hu, L. and Bentler, P. (1999). Cutoff criteria for fit indices in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55.
- Jackson, S. A. (1992). Athletes in flow: A qualitative investigation of flow states in elite figure skaters. *Journal of Applied Sport Psychology*, 4, 161-180.
- Jackson, S. A. (1995). Factors influencing the occurrence of flow in elite athletes. *Journal of Applied Sport Psychology*, 7, 138-166.
- Jackson, S. A. (2000). Joy, fun, and flow state in sport. In Y. L. Hanin (Ed.), *Emotions in Sport* (pp. 135-155). Champaign, IL: Human Kinetics.
- Jackson, S. A. and Eklund, R. C. (2002). Assessing flow in physical activity: The flow state scale-2 and dispositional flow scale-2. *Journal of Sport & Exercise Psychology*, 24, 133-150.
- Jackson, S. A. and Eklund, R. C. (2004). *The flow scale manual*. Morgantown, WV: Fitness Information Technology.
- Jackson, S. A., Kimiecik, J. C., Ford, S. and Marsh, H. W. (1998). Psychological correlates of flow in sport. *Journal of Sport & Exercise Psychology*, 20, 358-378.
- Jackson, S. A. and Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. *Journal of Sport & Exercise Psychology*, 18, 17-35.
- Jackson, S. A., Martin, A. J. and Eklund, R. C. (2008). Long and short measures of flow: The construct validity of the FSS-2, DFS-2, and new brief counterparts. *Journal of Sport & Exercise Psychology*, 30(5), 561-587.
- Jackson, S. A. and Roberts, G. C. (1992). Positive performance states of athletes: Toward a conceptual understanding of peak performance. *The Sport Psychologist*, 6, 156-171.
- Jackson, S. A., Thomas, P. R., Marsh, H. W. and Smethurst, C. J. (2001). Relationship between flow, self-concept, psychological skills, and performance. *Journal of Applied Sport Psychology*, 13, 129-153.
- Kawabata, M., Mallett, C. J. and Jackson, S. A. (2008). The flow state scale-2 and dispositional flow scale-2: Examination of factorial validity and reliability for Japanese adults. *Psychology of Sport and Exercise*, 9, 465-485.
- Kowal, J. and Fortier, M. S. (1999). Motivational determinants of flow: Contributions from self-determination theory. *The Journal of Social Psychology*, 139, 355-368.
- Kowal, J. and Fortier, M. S. (2000). Testing relationships from the hierarchical model of intrinsic and extrinsic motivation using flow as a motivational consequence. *Research Quarterly for Exercise & Sport*, 71, 171-181.
- Larkey, L., Jahnke, R., Etnier, J. and Gonzalez, J. (2009). Meditative movement as a category of exercise: Implications for research. *Journal of Physical Activity & Health*, 6, 230-238.
- López-Torres, M., Torregrosa, M. and Roca, J. (2007). Características del "Flow", ansiedad y estado emocional, en relación con el rendimiento de deportistas de elite. *Cuadernos de Psicología del Deporte*, 7(1), 25-44.
- Mardia, K. V. (1974). Applications of some measures of multivariate skewness and kurtosis in testing normality and robustness studies. *Sankhya, Series B*, 36, 115-128.
- Markland, D. and Ingledew, D. (1997). The measurement of exercise motives: Factor validity and invariance across gender of a revised Exercise Motivations Inventory. *British Journal of Health Psychology*, 2, 361-376.
- Marôco, J. (2010). Análise de equações estruturais. Fundamentos teóricos, software & aplicações. Pêro Pinheiro: ReportNumber.
- Marsh, H. W. and Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: First- and higher-order factor models and their invariance across groups. *Psychological Bulletin*, 97, 562-582.
- Marsh, H. W. and Jackson, S. A. (1999). Flow experience in sport: Construct validation of multidimensional, hierarchical state and trait responses. *Structural Equation Modeling*, 6, 343-371.
- McAuley, E., Duncan, T. and Tammen, V. (1989). Psychometric Properties of the Intrinsic Motivation Inventory in a Competitive Sport Setting: A Confirmatory Factor Analysis. *Research Quarterly for Exercise and Sport*, 60(1), 48-58.
- McAuley, E., Wraith, S. and Duncan, T. (1991). Self-efficacy, perceptions of success and intrinsic motivation for exercise. *Journal of Applied Social Psychology*, 21, 139-155.
- Moneta, G. B. (2004). The flow experience across cultures. *Journal of Happiness Studies*, 5, 115-121.
- Moreno, J. A., Cano, F. C., González-Cutre, D., Cervelló, E. and Ruiz, L. M. (2009). Flow disposicional en salvamento deportivo: Una aproximación desde la teoría de la autodeterminación. *Revista de Psicología del Deporte*, 18(1), 23-35.
- Nakamura, J. and Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder and S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 89-105). New York: Oxford University Press.
- Pereira, S. (2006). *Os motivos para a prática de exercício físico e a predição de abandono: Um estudo longitudinal*. Unpublished master's thesis. ISPA-IU.

- Rogatko, T. P. (2009). The influence of flow on positive affect in college students. *Journal of Happiness Studies*, 10, 133–148.
- Ryan, R. M. and Deci, E. L. (2007). Active human nature: Self-determination theory and the promotion and maintenance of sport, exercise and health. In M. S. Hagger and N. L. D. Chatzisarantis (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (pp. 1-19). Champaign, IL.: Human Kinetics.
- Steiger, R. J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research*, 25, 173–180.
- Vlachopoulos, S. P., Karageorghis, C. I. and Terry, P. C. (2000). Hierarchical confirmatory factor analysis of the flow state scale in exercise. *Journal of Sport Sciences*, 18, 815-823.
- Wan, C. and Chiou, W. (2006). Psychological motives and online games addiction: a test of flow theory and humanistic needs theory for taiwanese adolescents. *CyberPsychology and Behavior*, 9, 317–324.
- WHO (2002). *The World Health Report 2002: Reducing risks, promoting healthy life*. Geneva: The World Health Organization.

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