Original Article

Development and initial validation of an instrument measuring athletes' volition

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ABSTRACT

Proios, M. & Proios, I.M. (2014). Development and initial validation of an instrument measuring athletes' volition. *J. Hum. Sport Exerc., 9*(4), pp.761-772. This study describes the development and initial validation of a new instrument for the measurement of athletes' volition – the Measure Athletes' Volition (MAV). The findings from the exploratory factor analyses, which used 371 adolescent athletes, provided evidence for a six-factor solution with 23-item – goal (three items), effort with difficulties (four items), effort continuous (three items), persistence on effort (five items), decision making (three items), and intention (five items). Confirmatory factor analysis indicated that a 23-item and six-factor structure provided acceptable model fit. In addition, the findings further supported the reliability of the above mentioned model. **Key words**: DEVELOPMENT, VALIDATION, VOLITION, SPORT.

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INTRODUCTION

Volition is the basis of a conscious action and, more specifically, one's ability to make decisions in a specific way relying on conscious motivational forces (Proios, Mavrovouniotis, & Proios, 2012). In sports, such forces can often help one overcome several unexpected psychological and physical inner and outer resistances, such as fatigue, pain or fear. And this is because while athletes have high performance motivation, in such cases it is frequently inadequate (Birrer & Morgan, 2010).

Actions in sports are motivated (e.g. achievement goal), yet the action created by a stimulus isn't necessarily completed (Kuhl, 1983, 1985, 1987). In this case, in order the action to be completed, the intervention of volition is required in order to restore and strengthen an already existing intention to act. Beckmann (1987) maintained that volition may consist in increasing vigour, suggesting that an athlete with high volition would not stop an action when things get tough. Kehr (2004), Kuhl and Goschke (1994), as well as Sokolowski (1993) underlined the importance of volition in cases of insufficient motivation, particularly in actions against intrinsically motivated behavioral tendencies or actions lacking intrinsic motivation. Furthermore, researchers claim that volition is needed to support cognitive preferences insufficiently motivated by or discrepant from actual implicit behavioral tendencies (Kerh, 2004).

The importance of volition has been particularly emphasized in the fields of education and health (Corno, 2004; Corno & Knafer, 1993). Sport psychologists are also interested in the effects of volition on the improvement of athletic performance (e.g., Beckmann, 1999; Beckmann & Kazen, 1994; Beckmann & Strang, 1991; Beckmann, Szymanski, & Elbe, 2004; Elbe, Szymanski, Beckmann, 2005). However, the researchers' interest is still rather limited. A possible reason for this is the failure to understand the volition theory, as it bridges several fields of psychological research, including cognitive-motivational, social cognitive, and personality psychology (Corno, 2004).

The present study focuses on the development and initial validation of an instrument, namely the Measure Athletes' Volition (MAV), which measures the athletes' volition. Through the elements of volition, one can measure the strength of volition, which is the degree of confirmedness of intention as well as of determination to complete this intention. The literature comprises several instruments used in sport a) containing a set of elements of volition (e.g., Volitational Components Questionnaire [VCQ II; Kuhl & Fuhrmann, 1998]), b) containing only one element: persistence (e.g., Persistence Scale for Children; [PSC; Lufi & Cohen, 1987; Short-term Persistence (LeFoll, Rascle, & Higgins, 2006]).

Instrument development Measure Athletes' Volition (MAV)

The development of MAV was based on the viewpoint that volition is a psychic phenomenon that directs goal-oriented behavior, particularly in adverse conditions (Sechenov, 1952; as cited by Ryba, Stabulova, & Wrisberg, 2009). Analyzing volition as a psychic phenomenon, it is evident that it contains a set of components. These components are interactive and cognitive (e.g., self-monitoring during the execution of an exercise), emotional (e.g., expression of feelings that motivate the athlete to overcoming sport specific obstacles and aversive states and directs him/ her to take the necessary actions in order to avoid any possible negative emotional reactions), and operational (e.g., improvement of ability to concentrate, turn off depressive thoughts "shield one from fear") (Puni, 1971, 1977). These three structural components of volition are contained to some extent in any volitional manifestation (Ryba et al., 2009).

Volitional manifestations are also called volitional qualities; these are qualities such as persistence and perseverance, purposefulness, decisiveness and courage, initiative and independence, self-control and

composure (Ryba et al., 2009). In sport, the above mentioned volitional qualities are not so frequent; they have been argued to be related to the structural characteristics of each sport (Ryba et al., 2009). In a recent study, it was claimed that volitional qualities can be classified, on the basis of their frequency of appearance in sport, into primary (persistence, purposefulness and expedience), and secondary (courage / initiative and inventiveness) volitional qualities (Proios et al., 2012).

Testing volitional qualities is considered to provide us with a clear view on the athletes' volitional function. This can be ensured by considering mainly the primary volitional qualities. Here follows a brief discussion of each of the targeted constructs.

Persistence: Persistence is a personal skill describing the efforts undertaken by the individual to achieve a goal, for example in sports. The "persistence" factor contains two sub-factors "Effort continuous" and "Effort with difficulties". These sub-factors reveal an individual's relentless effort to overcome difficulties/ obstacles or not.

According to Bandura (1986) persistence is endurance, or the refusal to give up, especially when faced with opposition. Bandura and colleagues maintained that persistence is a skill affected by expectations of self-efficacy (Bandura, 1977; Bandura, Adams, & Beyer, 1977; Bandura & Schunk, 1981). When an individual possesses strong self-efficacy beliefs he/she is expected to exhibit the element of persistence in demanding activities (Bandura, 1982; Bandura & Cervone, 1983). Self-efficacy refers to the belief that an individual is able to behave in the manner required in order to achieve specific goals (Bandura, 1977).

Persistence, also, seems to be perceived as a psychological construct if another social cognitive theory of motivation – namely the self-determination theory – is taken into consideration. This theory suggests that humans have a set of needs that should be satisfied in the social context. One of these is the individual's needs to feel autonomous in performing an activity. According to Deci and Ryan (2000), autonomy involves being volitional in such a way as to represent one's integrated sense of self. Calvo, Cervello, Jimenez, Iglesias, and Murcia (2010) maintained the relation between autonomy and sport persistence.

Purposefulness The factor of purposefulness represents another personal skill and characterizes individuals who do not hesitate to make decisions and implement them (Proios et al., 2012). This factor is expressed through two sub-factors, namely "Decision making" and "Persistence on effort". These factors demonstrate the individual's ability to make decisions, as well as to show persistence in implementing a decision taken.

The components of purposefulness, that is decision making and its implementation are traits of an autonomous action. This action is possible because the individual who participates in decision making improves his/ her cognitive level. This is due to the strengthening of rationality of the decision information in order to generate and evaluate alternate pathways to a goal. Furthermore, it is also due to the belief that participation in decision-making contributes to the individuals' personal growth by enhancing their feelings of self-worth and self-confidence and by facilitating development of their problem-solving skills (Williams, 2001).

Expediency: Expediency is a construct suggesting that an individual's action serves a purpose, or is intentional. Expediency action can be expressed through psychological constructs such as "Intention" and "Goal-setting", which indicate two distinct factors, both expressions of the "Expediency" factor.

According to the planned behavior theory, intentions reveal the individual's behavioral performance through his/her effort to put a physical activity under volitional control (Ajzen, 1985). Furthermore, intention manifests the individual's commitment to the goal (Heckhausen, 1991).

These goals constitute a cognitive condition; they have the power of a motive because they affect not only the direction of behavior but also the intensity of effort made (Kostaridou-Efklides, 2012). Goal setting has been advocated as "a highly consistent and a robust performance enhancement strategy" (Burton & Naylor, 2002, p. 463). Filby, Maynard, and Graydon (1999), and Gould (2001) have suggested that goal setting is particularly effective in enhancing performance and positively affecting behavior when focusing on a combination of outcome, performance, and process goals. Goals have been maintained to influence performance in four distinct ways: a) directing attention, b) mobilizing effort, c) enhancing persistence, and d) developing new learning strategies (Merritt & Berger, 1998).

Assessment of items' clarity, applicability, and content relevance

Initially, a set of 60 items was developed to represent the constructs of volition in describing the content validity previously performed. Then, they were given to 115 athletes of the most popular sports in our country (a total of 20 sports). Their age ranged from 18 to 26 years (*M* = 21.35, *SD* = 3.65). They provided their responses on a seven-point Likert-type scale (1 = *totally unclear*; 7 = *totally clear*), on how clear each item was and commented choosing from alternative proposals for a clearer presentation of the items. Also, items were presented to 25 coaches working on the respective athletes' sports used. Coaches, making use of a dichotomous scale (applicable versus inapplicable), were asked to assess whether the items are applicable to the training sessions of their sports. Taking under consideration the athletes' and coaches' assessments and feedback, the items were reworded and part of them was deleted as unclear and non-occurring in all sports. A total of twenty-five items was deleted.

Finally, the remaining items were reviewed by two expert psychologists. They assessed the homogeneity of items in the six subscales to see whether there were any irrelevant or ambiguous items in the six subscales. Twelve items were deleted in this process.

MATERIAL AND METHODS

Participants

Participants in this study were 371 athletes (male n = 209, and female n = 158; four participants did not state their gender). Their age ranged from 18 to 24 years (M = 20.12, SD = 2.27). At the time of the study, athletes in the sample had been participating in 25 different sports. Their athletic experience ranged from 1 to 16 years (M = 9.16, SD = 3.65)

Instrument

In this study, a 23-item structure previously derived for the athletes' volition measurement (MAV) was used. The questionnaire was in the Greek language. The items of MAV contained constructs relevant to the three volitional qualities, namely persistence, purposefulness, and expediency. Each quality was assessed through two distinct constructs: for persistence Effort Continuous (e.g., "…I persist on performing an exercise") and Effort with Difficulties (e.g., "…I persist on performing exercises even when there is a risk of injury"); for purposefulness Decision Making (e.g., "…I perform the exercises without any hesitation") and Persistence on Effort (e.g., "…I quickly overcome the difficulties arising"); for expediency Intention (e.g., "…I exercise strenuously because it makes me feel satisfied") and goal-setting (e.g., "…I often pay more attention in some parts of the exercises"). The instrument started with the statement, "In training …". The

participants were asked to answer on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Procedures
The procedure for the completion of the questionnaires began when researchers contacted athletes and coaches in their training sports. Before contact, the appropriate permission for the cooperation of the athletes and trainers was requested and granted by the leagues. No participant was compensated for taking part in the study.

Data analyses
Data were examined to identify with the missing data points. The univariate normality of the items was assessed using the skewness and kurtosis of the responses. To explore the dimensionality of the MAV, we conducted a series factor analyses (exploratory and confirmatory analyses). Exploratory factor analysis was performed trying to establish the appropriate number of factors in order to explain the relation between observed variables. We employed both orthogonal (varimax) and oblique (promax) rotations. The following criteria were used to determine the number of factors to retain: (a) eigenvalues of the unrotated factors $\geq$ 1, (b) Cattell's scree test, (c) internally factors, and (d) factors that yield meaningful psychological constructs; while confirmatory factor analysis was used to clarify whether the factor structure that emerged from our data could match the models' existing conceptual structure.

In order to assess whether the specified models matched the observed data, several fit indices were employed. Based on Hu and Bentler's (1995) recommendations, model fit was assessed using the chi-square statistic, the confirmatory fit index (CFI), the Incremental fit index (IFI), and the root mean square error of approximation (RMSEA). The CFI and the IFI values range from 0 to 1 with values of 0.90 or greater showing acceptable fit of the model (e.g. Hu & Bentler, 1995; Joreskog, 1993) and values of 0.95 or greater showing good fit of the model (Hu & Bentler, 1999). For RMSEA, values of 0.08 or less indicate a reasonable fit of the data whereas values of 0.05 or less indicate a good fit of the data (Browne & Cudeck, 1993). Analyses were conducted using SPSS for Windows 15.0 (SPSS, Chicago, IL) and AMOS 7.0 (SPSS, Chicago, IL).

RESULTS

Preliminary results
Prior to analyses, data were examined for the presence of univariate and multivariate outliers (Tabachnick & Fidell, 2001), which might attenuate the results. The former was analyzed through standardized scores ($z \geq 3.30$) and the latter thought Mahalanobis Distance ($p < .001$) and Studentized Deleted Residual (greater than ± 4.00). Few univariate outliers were identified as having high z scores while no multivariate outliers were found. Also, the normality of each of the 23 items was investigated in terms of its skewness (-1.83 to 0.32, M = 0.90) and kurtosis (-.02 to 5.51, M = 1.38). These values were all within the level recommended for a CFA with maximum-likelihood estimation (skew > 2, Kurtosis > 7; West, Finch, & Curran, 1995), supporting the normality assumption for all variables. For this, no cases were deleted.

Exploratory factor analyses
This analysis was used because the correlation between the observed and latent variables was uncertain (Byrne, 2001). MAV is a new tool designed to measure three qualities of volition using six different

construct. Thus, EFA was used to determine the extent to which the item measurements (the observed variables) were related to the six latent constructs.

Preanalysis tests for the suitability of data of this study for factor analysis were computed, as recommended by Comrey (1978). The Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy was 0.839. Results of .80 and above indicated that the researchers can promptly proceed with the factor analysis (Kaiser, 1974). The probability associated with Bartlett's (1950) Test of Shericity was less than 0.01, $x^2(2253) = 2363.16$, $p < 0.001$, indicating that the correlations in the intercorrelation matrix were significantly different from zero. The ratio in these cases was 371:23 or 16.1:1, covering the preconditions determined by some factor analysts (e.g., Gorsuch, 1983; Nunnally, 1978).

An initial factor analysis without iteration was computed. The Scree Test (Cattell, 1966) indicated a six-factor solution. All factors held eigenvalues greater than unity (Cattell, 1978), whilst this six-factor solution accounted for 55.95% of the total variance. A further analysis was thus computed, reducing the number of factors to six, by means of iteration and rotation (varimax and oblique). Items with a loading of more than .40 were considered to load on one factor (Hinkin, 1995). Both varimax and oblique rotations produced the same solution that seemed to represent the six-factor structure proposed in the present study, accounting for 55.95% of the total variance. The factor loadings are presented in Table 1.

Table 1. *Item loadings, item-total subscale correlations and Cronbach α for MAV*

Total MAV-scale	Composite Scale	Subscales	Factor loading	Item-total correlation
Volition	Persistence	***Factor 1: Effort Continuous (EC)*** α = 0.83		
		EC1. I persist on performing an exercise.	0.865	0.748
		EC2. I persist on performing combined exercises even when I feel tired.	0.865	0.748
		EC3. I persist on fully performing a number of exercises (programs) set, even when I feel tired.	0.764	0.587
		Factor 2: Effort with Difficulties) (ED) α = 0.62		
		ED1. I persist on performing exercises even when there is a risk of injury.	0.552	0.370
		ED2. I persist on performing exercises even in the coach's absence.	0.576	0.448
		ED3. I often persist on performing exercises even when I am not sure of their successful outcome.	0.704	0.329
		ED4. I persist on exercising even under adverse conditions.	0.450	0.449
	Purposefulness	***Factor 3: Decision Making) (DM)*** α = 0.65		
		DM1. I do not hesitate to perform difficult exercises.	0.655	0.399
		DM2. I perform the exercises without any hesitation.	0.655	0.498
		DM3. I do not hesitate to perform new exercises.	0.739	0.479

	Factor 4: Persistence in the Effort (PE) α = 0.68		
	PE1. I do not hesitate to take problem solving initiatives.	0.689	0.348
	PE2. I quickly overcome the difficulties arising.	0.485	0.424
	PE3. I feel capable to perform what I am asked to.	0.487	0.447
	PE4. I like to assume responsibility.	0.480	0.443
	PE5. I am good in decision making.	0.732	0.493
Expediency	***Factor 5: Intention (I)*** α = 0.63		
	I1. I exercise strenuously because I want to improve.	0.623	0.410
	I2. I exercise strenuously because it makes me feel satisfied.	0567	0.446
	I3. When I start the performance of an exercise I complete it.	0.696	0.461
	Factor 6: Goal-Setting (GS) α = 0.70		
	G1. I aim at achieving the goals I set myself.	0.404	0.316
	G2. I often pay more attention to some exercises.	0.801	0.501
	G3. I often pay more attention to some parts of the exercises.	0.573	0.522
	G4. I try not to waste any time during training.	0.744	0.583
	G5. I try alternatives to anticipate any problems that might rise during the game.	0.409	0.384

More specifically, three items were loaded on Factor 1, accounting for 23.8% of the total variance. All items had been hypothesized to represent the construct of intention. Three items were loaded on Factor 2, accounting for 10.93%. These items had been hypothesized to represent the dimension of effort continuous. Four items were loaded on Factor 3, accounting for 6.38%. These items had been hypothesized to represent the dimension of effort with difficulties. Five items were loaded on Factor 4, accounting for 5.34%. These items had been hypothesized to represent the dimension of persistence on effort. Three items were loaded on Factor 5, accounting for 4.91%. These items had been hypothesized to represent the dimension of decision making. Five items were loaded on Factor 6, accounting for 4.58%. These items had been hypothesized to represent the dimension of goal-setting.

Confirmatory factor analyses

A confirmatory factor analysis was applied because the MAV was developed based on theoretical grounds, specific hypotheses regarding which items should load significantly on which scale were suitable for confirmatory factor analysis (Stevens, 1996). Based on content validity the factorial structure of the MAV was tested making use of four-model sequential confirmatory factor analyses (Table 2): (1) a 6-factor uncorrelated model; (2) a 6-factor correlated model; (3) a 3-factor correlated model; and (4) a 1-factor model. All models produced a statically significant x^2 value (see Table 2), indicating that the observed and specified models differed. However, only the 6-factor correlated model exhibited an adequate fit (CFI = 0.904, IFI = 0.907, and RMSEA = 0.051).

Table 2. *Fit indices for the four models*

Models	X^2	*df*	*p*	CFI	IFI	RMSEA
Model 1: Uncorrelated six-factor first-order model	961.6	230	.000	0.661	0.668	0.093
Model 2: Correlated six-factor first-order model	421.2	215	.000	**0.904**	**0.907**	**0.051**
Model 3: Three-factor second-order model	902.5	230	.000	0.674	0.681	0.089
Model 4: High-order model	1186.6	230	.000	0.535	0.442	0.106

Note: X^2=chi-square statistic, CFI=Confirmatory fit index, IFI= Incremental fit index, RMSEA=Root mean square error of approximation.

Internal consistency

The internal consistency reliability was assessed using Cronbach's alpha and average interitem correlation. Cronbach's index of internal consistency ranged from 0.62 to 0.83 (see Table 1), with two subscales showing acceptable alpha coefficient ($\alpha > 0.70$; Kline, 2005) and four subscales showing moderately low alpha coefficient ($0.61 < \alpha < 0.70$; Kline, 2005). However, since alpha coefficient is affected by the number of items (Cortina, 1993), it is maintained that when the number of items is small, the measure should be considered reliable (Schmitt, 1996). In the present study, the four factors which exhibited alpha values below the acceptable limit comprised three, four and five items, respectively. According to Ntoumanis (2001) and Pallant (2010) the values 0.62, 0.65, 0.68 and 0.63 of factors present in this study, can be considered satisfactory, since these factors comprise less than ten items (four, three, four, five and three items, respectively).

The average interitem correlations for the six factors were 0.44, 0.69, 0.40, 0.43, 0.46, and 0.46. An average interitem correlation of .30 or higher indicates acceptable reliability (Robinson, Shaver, & Wrightsman, 1991).

DISCUSSION AND CONCLUSIONS

The purpose of the present study was to develop and perform an initial validation of an instrument to assess the most frequent volition qualities in sport. The development of the instrument was based on the viewpoint that volition is a multidimensional construct consisting of a set of components. These components, in the present study, were assumed to constitute part of volition qualities *effort continuous* and *effort with difficulties* of persistence; *decision making* and *persistence in the effort* of purposefulness, and *goal-setting* and *intention* of expediency quality. A 23-item scale Measure Athletes' Volition (MAV) was developed based on the content of the constructs of the above mentioned components.

Then, the construct validity method was used to examine whether MAV measures the six components of the aforementioned volitional qualities (Anastasi, 1997). Construct validity focuses on how well the variables chosen by the researcher to represent a hypothetical construct really capture the essence of that

hypothetical construct (Stapleton, 1997). The factor analyses of the study confirmed that the multidimensional of volition a priori specified was fairly reliably reproduced. Exploratory factor analysis of a six-factor model was indicated by means of the 23-item scale. These factors were consistent with the theoretical framework previously maintained in the Introduction.

The factorial validity of the MAV was also supported through the confirmatory factor analysis. CFA revealed satisfactory fit indices for the hypothesized 6-factor correlated model, thus supporting the multidimensional approach to the way MAV functions and providing psychometric evidence for the factorial validity of the instrument.

Supportive evidence concerning the internal consistency and average interitem correlation reliability of subscale scores was also found. The relative low Cronbach's alphas for some factors are likely to be caused by small numbers of items per scale. The average interitem correlations for all factors are well above the criterion (≥ 0.30) for an acceptable internal consistency (Robinson et al., 1991), indicating the items within each subscale are highly correlated. In addition, the number of items in each factor meets the minimum number of three items for best practice in factor analysis (Costello & Osborne, 2005).

The advantage of developing and using a questionnaire such as MAV, to assess the athletes' volition to participate in sports, lies in the coaches' ability to quantify athlete volitional qualities within a relatively short period of time using an instrument that produces internally consistent and valid information. This information may contribute to coaches developing strategies concerning psychological skills training to improve the athletes' performance.

A number of limitations of the study and directions for future work warrant comment. The current study used adolescent athletes; future research efforts are necessary, including repeating the present study to include younger and older athletes. This study did not test the criterion-related validity of MAV; future studies are necessary to explore, for example, the predictive and concurrent validity of MAV. An applicable route would be to examine the relations between the six components of volitional qualities assessed by the MAV and the athletes' performance. Research indicates that volition is related to athletic achievement (e.g., Beckmann et al., 2004). The development of the MAV items was based on the components of three volitional qualities, yet according to the literature the volitional qualities are more than three. Therefore, this work should be viewed as the starting point for a continuous validation and revision process also comprising other volitional qualities in the present instrument as well.

In conclusion, the Measure Athletes' Volition is a sport-specific measure of volition based on the athletes' experience, which assesses: persistence (effort continuous and effort with difficulties), purposefulness (decision making and persistence in the effort) and expediency (goal-setting and intention). The MAV shows good evidence of validity and reliability and provides a clear picture of the athletes' volitional function than other measures used in sport research.

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