

The process toward commitment to running – The role of different motives,
involvement, and coaching

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Abstract

The purpose of this investigation was twofold: (a) to explore and describe the relationships between different facets of motivation, involvement, and commitment to running, and (b) to test whether recreational coached runners differ from non-coached runners in their motivation, involvement, and commitment to running. Drawing on the psychological continuum model (PCM), a model was proposed to test relationships among motives, attitudinal and behavioral involvement, and commitment to running as a leisure activity. Results showed that two (enjoyment and health) out of five motives were significant indicators of attitudinal involvement. Attitudinal involvement was a significant predictor of behavioral involvement, which in turn was a significant predictor of commitment. Coached runners differed from non-coached runners in all tested variables. The structural relationships among the variables varied based on the tested group. Implications for theory and practice are presented.

Keywords: active leisure, serious leisure, running event

1 Introduction

People have different motives to engage in active leisure activities, such as running (Funk, Jordan, Ridinger, & Kaplanidou, 2011; Yair, 1992). Motivation is the first positive attitude that pushes people to consume active leisure activities (Madrigal, 2006; Trail, Anderson, & Fink, 2000). Motivation was defined by Mitchell (1982) as an individual psychological process that arouses and directs intentional behaviors. In this investigation, we explore different motives that people might have to run and to describe the relationship between motives and other attitudes, such as involvement and commitment to running. Although researchers have described some different motives for which people engage in active leisure activities, there is a gap regarding the relationship between different motives and intentions to continue exercising.

Different motives to run might push runners to different levels of involvement with running (Beaton, Funk, Ridinger, & Jordan, 2011; Funk et al., 2011). People who run for fun, enjoyment or pleasure might be more involved with running than those who run for a sense of obligation, for example, to avoid diseases (Funk et al., 2011). Beaton et al. (2011) defined sport involvement as an attitude that emerges when individuals perceived that sport occupies a central part in their lives and provides hedonic (i.e., pleasurable) and symbolic values for them. Based on Ajzen's (1991) theory of planned behavior, Funk et al. (2011) proposed that attitudinal involvement with running should affect behavioral involvement, which has been empirically represented by, for example, participation in running events and time spent in running training sessions. After getting involved with a leisure activity, people may develop increased attachment to this activity and become committed to it (Beaton et al., 2011; Iwasaki & Havitz, 2004). Previous researchers have provided support for the idea that involvement and commitment are related but distinct constructs (Iwasaki & Havitz,

2004). For this research, we followed Pritchard et al. (1999) and Iwasaki and Havitz (2004) and defined commitment as a stable preference guided by an attitude of resistance to change.

The rationale of this research is that different motives may have different effects on attitudinal involvement, which should affect behavioral involvement, which in turn should affect commitment to running as a leisure activity. We drew on the psychological continuum model (PCM - Funk & James, 2001) in setting up our study. The PCM is a theoretical framework that consists of four hierarchical stages: awareness, attraction, attachment, and allegiance (Beaton & Funk, 2008). We proposed that different motives represent the fuel for action, which pushes individuals from the awareness stage to the attraction stage. Then, attitudinal and behavioral involvement represent forces that push individuals from the attraction stage to the attachment stage. The higher the levels of involvement, the more individuals are likely to become attached to running. Finally, we propose commitment to running as representing an attitude responsible for moving individuals from the attachment stage to the allegiance stage. This sequence of attitudes and behaviors toward running has not been empirically tested yet. The existence of a logical sequence of attitudes does not mean that specific attitudes are present only in one or another level of the PCM. That is, motives are not present only in the awareness stage, nor is involvement present only in the attraction and attachment stages. Beaton et al. (2011) proposed that by the end of the awareness stage, individuals start to show some little involvement, which is necessary to bring them to the next stage of attraction to a sport object. By moving from the attachment to the allegiance stage, the levels of involvement are supposed to be very high. Therefore, in different stages of PCM, different attitudes are present at different levels. Different attitudes at each PCM stage implicitly exist on a continuum that encompass all levels

across stages. We propose that different motives should lead to different levels of involvement, which in turn should lead to different levels of commitment. As proposed by Funk and James (2001), depending on the strength of one's attitudes toward the sport object, "an individual may not progress beyond certain level [of the PCM]" (p. 124).

In analyzing attitudes and behaviors toward running, previous scholars have investigated either isolated constructs or relationships between pairs of constructs. For example, Beaton et al. (2011) classified runners into theoretically meaningful groups within the PCM based on their levels of involvement. They classified runners based on their low, medium, or high perceptions of the role of running in their lives in terms of three dimensions of involvement: centrality, hedonic value, and symbolic value. For instance, runners with high perceptions in any two dimensions were classified in the allegiance stage of the PCM. Funk, Toohey, and Bruun (2007) investigated different motives of runners to register into a running event, while Funk et al. (2011) used event participation motives to explain future exercise intentions. In none of these previous studies have researchers approached motives as plausible antecedents of involvement and commitment. Interestingly, they used the PCM as the theoretical framework, but they did not investigate the process toward allegiance. Rather, they took pictures of specific moments inside that process. In this sense, we justify the need of an investigation that focuses in *the process*. In other words, runners present different levels of involvement and that motives can affect attitudes toward running, but less well understood is whether different motives explain different levels of involvement and different levels of commitment to running. In this sense, the first purpose of this investigation was to explore and describe the relationships between different facets of motivation, involvement, and commitment to running.

Additionally, we tested whether recreational coached runners (i.e., those who pay to receive instruction from a running club or a running expert) differ from non-coached runners (i.e., those who run based on their own knowledge, not paying for any type of instruction) in their motivation, involvement, and commitment to running. Funk et al. (2011) suggested that about one third of participants in running events have belonged to organized running clubs. The quest for running clubs and coaching to run may imply that some recreational runners are taking running too seriously to be considered casual runners. In the Brazilian context, people join running clubs almost exclusively to receive coaching orientation. They pay for coaching services in the running clubs – the organizations that offer this type of services. In the context of this research, runners become members of running clubs to be coached and to receive orientation related to training, nutrition, apparel usage, and any other factor that may help them to improve their running performance. Considering that coached runners are investing more time, money, and effort to improve performance, they might differ from non-coached runners in their attitudes and behaviors toward running. Running club managers and other professionals (such as, personal trainers or personal running coaches) should be interested in knowing differences and similarities between these two groups of runners (probably two market segments), in order to be more effective in their marketing strategies and to deliver better services.

1.1 Processes of engagement with active leisure activities

The PCM (Funk & James, 2001) is said to be part of a group of models, proposed to explain the process of engagement with sport (Weed et al., 2015). Along with the PCM, the trans-theoretical model (Prochaska, DiClemente, & Norcross, 1992) and the exercise adoption model (Brooks, Lindenfeld, & Chovanec, 1996) have been adopted as theoretical backgrounds in many previous investigations about active leisure

engagement (Weed et al., 2015). We chose the PCM as the theoretical background based on previous studies, which advocate for the suitability of this model over the others, when the aim of the research is to answer practical questions related to active leisure or participation sport (Beaton & Funk, 2008). The PCM has been successfully applied in different studies to explain engagement with active leisure activities (Beaton & Funk, 2008; Stewart, Shamdasani, & Rook, 2007).

The PCM is a theoretical framework that proposes that participants move from an initial stage of awareness to a final stage of allegiance, passing through attraction and attachment to an active leisure activity (Funk & James, 2001). At the awareness stage, individuals get into contact with one or more leisure activities, but have not decided yet about participation. Awareness represents an input for the attraction stage, where individuals start participating in leisure activities to meet a need or to seek a benefit as an answer to psychological, social, and/or environmental factors (Beaton et al., 2011). Motivation represents a major force for individuals to participate in active leisure activities (Alexandris, Tsorbatzoudis, & Grouios, 2002). People can become attracted to active leisure activities for different motives, such as enjoyment, competence, challenge, appearance, social reasons, and health improvement (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Attraction represents an input for the attachment stage, where individuals become increasingly involved with the leisure activity, assigning personal meaning to this activity (Funk & James, 2006). At the attachment stage, attitudinal involvement emerges when individuals perceive that the leisure activity has a central part in their lives and provides hedonic and symbolic value. Attitudinal involvement usually progress to behavioral involvement, when participants invest large amounts of time and resources to keep practicing their favorite leisure activity (Beaton et al., 2011). High levels of involvement may move individuals to the allegiance stage, where they

become completely committed to the activity. Commitment represents a stable preference guided by an attitude of resistance to change, indicating that individuals would not be willing to change their active leisure activity by any other (Iwasaki & Havitz, 2004; Pritchard et al., 1999).

Running is an active leisure activity with potential to move participants up to the allegiance stage (Funk et al., 2011; Ridinger, Funk, Jordan, & Kaplanidou, 2012). Depending on the involvement level, running practices may affect other aspects of runners' lives, such work schedules, family time, rest time, and meal plans (Ridinger et al., 2012). However, not all recreational runners become extremely involved with running or move up to the allegiance stage. We argue that different motives may lead to different levels of involvement. Using the PCM terminology, attraction and attachment to running may be somehow affected by personal motives that individuals have to run.

1.2 Motivation and involvement

Previous scholars have used general scales of physical exercise motivation to investigate different motives people have to run (e.g., Funk et al., 2011). The motivation for physical activities measure (MPAM - Frederick & Ryan, 1993) was one of the first inventories proposed to gauge motivation for physical exercise as a multidimensional construct. Later, this instrument was revised (Ryan et al., 1997) and it still is one of the most cited inventories in the literature to measure motivation for physical exercise (Vallerand, 2007). One advantage of this instrument is its parsimony. Ryan et al. found that five general motives (i.e., enjoyment, competence/challenge, appearance, health/fitness, and social relationship), represented by 30 items, could summarize people's motivation for exercising. Another advantage of this instrument is that it considers both intrinsic and extrinsic dimensions of motivation.

Early studies of motivation proposed that two types of motivation exist: intrinsic and extrinsic motivation (Deci & Ryan, 1985; Pelletier et al., 1995). Intrinsic motivation represents forces that initiate and direct human behaviors based on the simple pleasure and satisfaction that come as a result of doing such activities (Iso-Ahola, 1999; Pelletier et al., 1995). When people are intrinsically motivated, they do certain activities voluntarily and in the absence of external rewards (Deci & Ryan, 1985). Extrinsic motivation is the forces that direct human behaviors based on external rewards, where behaviors represent a means to attain an end – the reward, which can have physical, emotional, or psychological nature (Iso-Ahola, 1999; Pelletier et al., 1995). Deci and Ryan (1985) developed the self-determination theory proposing that motivation is better understood as a continuum, which runs from intrinsic motivation to extrinsic motivation to amotivation, which represents the lack of any motivation to do a certain activity. In other words, when individuals engage in any activity during their lives, they have different levels of intrinsic and extrinsic motivations, depending on how much they do the activity either by the pleasure it causes or by the rewards it brings.

A number of authors have tested the relationship between different motives and involvement in the context of sport spectatorship (Funk, Ridinger, & Moorman, 2004) and in the context of sport participation (Havitz, Kaczynski, & Mannell, 2013). Using the PCM as the theoretical background, Funk et al. (2004) proposed that different motives should explain different dimensions of spectators' involvement with team sports. In their argument, people who attend games for social motives are involved with team sports through the dimension of centrality, while people who attend games for supporting motives (e.g., to support women's sport, to support the local community) are involved with team sports through the dimension of self-expression. In the context of sport participation, Havitz et al. (2013) suggested that the relationship between

involvement with active leisure activities and motives for being physically active should be consistently positive and strong. However, they did not test any directional relationship between motives and involvement with active leisure. Therefore, considering both Funk et al.'s (2014) and Havitz et al.'s (2013) findings and assumptions, a preliminary question should be whether different motives lead to different levels of involvement with sport practices. Beaton et al. (2011) described that the antecedents of involvement have been broadly classified in individual and environmental variables, which they called sources of involvement. Among the individual sources, Beaton et al. named motives as the first psychological antecedent to involvement with active leisure activities, such as running. Although theoretically appealing, the directional relationship between motives and involvement with active leisure has not been tested. Applying Deci and Ryan's (1985) self-determination theory to the context of active leisure indicates that intrinsic motives might lead to higher levels of involvement when compared to extrinsic motives.

Ryan et al. (1997) proposed that individuals who present higher intrinsic motivation are mainly motivated by enjoyment and competence motives; while individuals who present higher extrinsic motivation are mainly motivated by motives that are separated from the activity itself (appearance, health, or social relationship). The authors found that exercise participation was associated with motives of enjoyment, competence, and social relationship, but not with motives of appearance and health. Funk et al. (2011) reported that different motives would be associated with running commitment and future exercise intent. They found that involvement was a significant predictor of running commitment, but they did not test directional relationships between different motives and involvement. Although directional relationships have not been tested, based on the differences between intrinsic and extrinsic motivation, runners with

higher motivation to run for enjoyment and competence may become more involved with running than runners with higher motivation for appearance, health, and social relationship. Different relations may exist between different motives and attitudinal involvement. This leads to our first hypothesis.

H₁: Different motives lead to different levels of attitudinal involvement with running.

Researchers have proposed a difference between situational and enduring attitudinal involvement (Filo, Funk, & O'Brien, 2009; Havitz & Mannell, 2005). That is, attitudinal involvement can have either a situational or an enduring nature. Situational involvement represents a temporary and context-dependent condition that stimulates a person to engage in a specific sport activity during a specific moment (Havitz & Mannell, 2005). On the other hand, enduring involvement is not context dependent, but is stable across situations, and consequently it is assumed to be a predictor of behavioral involvement (Havitz et al., 2013). Considering these characteristics, in the current research we focused on enduring attitudinal involvement. This option does not deny the importance of situational involvement. Rather, it represents a research strategy to delimit the object of study. Moreover, in analyzing the influences of attitudinal involvement on behavioral involvement, it makes more sense and is supported by the literature the use of enduring attitudinal involvement.

The idea that attitudes lead to behaviors was proposed by the theory of planned behavior (Ajzen, 1991; Ajzen & Fishbein, 1977). Since 1977, Ajzen and Fishbein have recognized the existence of a “disenchantment with the attitude concept” and the belief that “measures of attitude have little value for the prediction of overt behavior” (p. 888). After a thorough review of literature, they noticed that most of the criticism came from researchers who failed to provide correspondence between attitudinal and behavioral

entities. In other words, when the elements of the attitudinal entity did not correspond to the action elements of the behavioral entity, only low or non-significant correlations were found. However, when the action elements of both entities (attitudes and behaviors) corresponded to each other, the attitude-behavior relationship was found to be high and significant (Ajzen & Fishbein, 1977). For example, the behavioral criterion of “monetary donations to a church” should be correlated to attitudes toward “donating money to a church,” but it is not necessarily correlated to attitudes toward “attending a church”. Previous meta-analysis have shown that, when there is a logical fit between the attitudinal entity and the behavioral entity, the correlation between intentions and actual behaviors ranged from 0.43 to 0.53 (McEachan, Conner, Taylor, & Lawton, 2011; Sheeran, 2002). Ajzen and Fishbein (1977) proposed that people’s behaviors are systematically related to their attitudes “when the nature of attitudinal predictors and behavioral criteria are taken into consideration” (p. 888). In the context of the current study, it makes sense to use the theory of planned behavior to hypothesize a positive relationship between attitudinal involvement with running and behavioral involvement with running, due to the logical fit between the attitudinal entity and the behavioral entity.

According to Funk et al. (2011), “theory and empirical research on running events supports the notion that attitudinal involvement and behavioral involvement are positively correlated” (p. 252). Although previous researchers have assumed that attitudinal involvement should lead to behavioral involvement (Havitz et al., 2013), this relationship has not been tested yet in the context of active leisure. Previous scholars have jumped from attitudinal involvement to commitment, not testing a possible mediator function of behavior involvement (e.g., Ridinger et al., 2012). This yields our second hypothesis.

H₂: Attitudinal involvement leads to behavioral involvement with running.

1.3 Involvement and Commitment

Some scholars have investigated psychological commitment of active leisure participants as represented by resistance to change (Funk et al., 2011; Iwasaki & Havitz, 2004; Ridinger et al., 2012). They have applied Pritchard et al.'s (1999) scale of resistance to change to operationally define commitment. Pritchard et al. argue that commitment can be understood "as a stable preference that was bound by an attitude of resistance to change" (p. 335). In the context of active leisure participation, commitment is seen as a consequence of other attitudes, such as involvement (Beaton et al., 2011). Other scholars tested attitudinal involvement as an antecedent of commitment (Iwasaki & Havitz, 2004; Ridinger et al., 2012). For example, Ridinger et al. (2012) found that two facets of attitudinal involvement – pleasure and centrality – explained large portions of variance in commitment of runners. Funk et al. (2011) used prior running events in the last 12 months, race distance, and physical activity level of runners as indicators of behavioral involvement with running. They found that behavioral involvement was significantly correlated with running commitment. No previous investigators have examined a directional relationship from attitudinal involvement to behavioral involvement and, then, from behavioral involvement to commitment. Considering the theory of planned behavior and the PCM model, it is reasonable to expect such directional paths. This yields our third hypothesis.

H₃: Behavioral involvement leads to commitment with running.

Based on the three-above stated hypotheses, a structural model was designed (Figure 1). The model as a whole shows the suitability of the PCM model to explain the process through which commitment with running might be formed. Testing the path coefficients will test each of the proposed hypotheses.

Insert Figure 1 about here

1.4 Coached vs. non-coached runners

As mentioned before, about one third of runners who take part in running events are part of organized running clubs (Funk et al., 2011). Running is a natural movement and, as such, does not require any kind of special coaching from professionals to be executed. When people start to look for professional coaching to improve their running skills, this activity becomes similar to what Stebbins (2001) calls serious leisure. To Stebbins, serious leisure differs from casual leisure, inasmuch as the former is based on substantial skill, knowledge, and experience, requires perseverance, and has costs. In this sense, coached runners are more likely to consume running as a serious leisure activity than non-coached runners.

Wicker and Hallmann (2013) found that runners with different demographic and psychographic characteristics expressed different levels of willingness to pay for participating in running events. We propose that runners who see running as a serious leisure activity are more willing to pay for coaching, because their aims are more difficult to be attained without such coaching. We did not identify a study comparing coached and non-coached runners in their attitudes toward running. Coached runners pay for some professional coaching, which make us to believe that they are also investing more time and other resources to improve their running skills. They should differ from non-coached runners in their motivation, involvement, and commitment to running. This leads us to two research questions.

RQ₁: Do coached runners (those who pay to receive instruction from a running club or running expert) differ from non-coached runners in their motives, involvement, and commitment to running?

RQ₂: Is the process toward commitment to running different between coached runners and non-coached runners?

2 Method

2.1 Participants

We surveyed participants ($N = 2,351$) of one of the most traditional 5k/10k running races in Brazil. This race does not offer money prizes; therefore, participants take part in the race for leisure. We chose this race specifically because the focus of this research is on recreational runners. After sending the survey invitation via email, 366 messages bounced back due to incorrect email addresses or full mailbox. We received back 605 usable questionnaires, representing a response rate of 30.5%. Among the participants, 58.5% were male, 56.2% belonged to a running club and received coaching to practice run, 48.8% were married, and 68.5% had some kind of higher education. On average, they were 38.3 years old ($SD = 12.27$), they had 7.6 years ($SD=8.76$) of experience as amateur runners, they ran 3.15 days ($SD = 1.21$) per week, during 55.5 minutes ($SD = 20.34$) per session, and they participated in six running events ($SD = 5.74$) in the last 12 months. Coached runners did not differ significantly from non-coached runners in terms of gender (45% of coached runners were female), marital status (52% of coached runners were married or in a stable relationship), and education (58% of coached runners had some kind of higher education). These two groups did not differ either in terms of age ($t = -0.411$, $p = 0.681$), but they did differ in terms of year of experience ($t = 2.477$, $p = 0.014$). Years of experience was used a covariate when comparing these two groups.

2.2 Measures

2.2.1 Motivation

We used the revised version of Ryan et al.'s (1997) MPAM, which measures motivation based on five dimensions: enjoyment, competence, appearance, health, and social relationship. In the original use of this scale, testing fitness center members, Ryan et al. (1997) found indications of good internal consistency (Cronbach's ranging from .78 to .92) and good convergent validity – average variance extracted (AVE ranging from .50 to .59) – to support a scale with five dimensions. More recently, Battistelli, Montani, Guicciardi, and Bertinato (2016) supported the same five dimensions of the MPAM, showing evidences of reliability (all alphas above .70), convergent validity (all factor loadings above .50), and discriminant validity (correlations among dimensions all below .85). We selected three items (those with the highest factor loadings in the original research) for each dimension of motivation from Ryan et al.'s instrument. The stem for the items in this scale reads, "I run because..." (e.g.: ... I enjoy this activity). The items were measured on a 7-point Likert scale, ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*).

2.2.2 Attitudinal Involvement

We used Beaton et al.'s (2011) scales, which contain three dimensions of attitudinal involvement: hedonic value, centrality, and symbolic value; each one represented by three items. The original scale showed good psychometric properties. The reported Cronbach's alpha ranged from .82 to .86, indicating good reliability; the AVE varied from .55 to .67, supporting convergent validity. Finally, discrimination validity was demonstrated as the AVE for each dimension was greater than the square correlations between pairs of constructs (Beaton et al., 2011). The stem for the items in this scale reads, "I am involved with running because..." (e.g.: ... running is fun). The items were measured on a 7-point Likert scale, ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*).

2.2.3 Behavioral Involvement

We followed Funk et al. (2011) and measured behavioral involvement using three questions. First, they provided the number of running practices they have per week. Second, they informed the average duration of their daily running practice. Finally, runners were asked to indicate the number of prior running events they had participated in the last 12 months. Due to the differences in the unities of measurement (days in a week, minutes in a day, and events in a year), the variance was expected to be unequal among the three indicators. Moreover, individuals can show their involvement by one way (e.g. training more days per week), but not by another (e.g. participating in events). Thus, we did not incorporate the three variables into one latent variable. Rather, we considered all three as individual indicators of behavioral involvement.

2.2.4 Commitment

We followed previous investigations (Funk et al., 2011; Ridinger et al., 2012) and used three items representing resistance to change (adapted from Pritchard et al.'s (1999) scale) as a measure of commitment to running. Investigating commitment to running, Funk et al. (2011) reported that the scale presented good reliability (Cronbach alpha = .83). Applying the same scale in runners, Ridinger et al. (2012) found good psychometric properties – reliability (alpha = .83), convergent validity (AVE = .66), and discriminant validity (the AVE exceeded the squared correlation between commitment and any other construct in the study). The stem for the items in this scale reads, “Please, indicate your level of agreement with the following statements” (e.g.: My preference to running over other sports would not willingly change). The items were measured on a 7-point Likert scale, ranging from 1 (*very strongly disagree*) to 7 (*very strongly agree*).

2.3 Procedure

We collected data using online questionnaires. After contacting the race organizers, they agreed in providing email addresses of all participants. The procedures were approved by a local institutional review board. We sent an invitation email one week after the race and another email with the link to the questionnaire two weeks after the race. We sent a reminder for those who had not responded yet, a week after the initial deployment. A week after the reminder, we closed the survey, in such a way that we collected all the data until three weeks after the race. We deleted names and email addresses of all respondents immediately after the data collection was concluded, in order to ensure the confidentiality of all participants. They have not received any kind of incentive to respond the questionnaire. In the invitation email, we informed that their responses would be very important to improve the services offered by running clubs' coaches. To check for non-response bias, the mean scores of early and late respondents were compared in all latent variables (dimensions of motivation, dimensions of attitudinal involvement, and commitment) and in the three manifest variables representing behavioral involvement (Rogelberg & Luong, 1998). We considered late respondents those who answered the questionnaire after the reminder. Results of the t tests with Bonferroni correction showed no differences (all $p \geq .139$) between early and late respondents, indicating that non-response bias should not be a major concern.

2.4 Data Analysis

To test the three hypotheses, we carried out a covariance-based structural equation modeling (SEM) analysis using the whole sample of runners ($n = 605$). We applied Anderson and Gerbing's (1988) two step approach, testing the measurement model via confirmatory factor analysis (first step) and, then, the structural model via SEM (second step). In the first step, as for the model fit indexes, we used the root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-

Lewis index (TLI). For RMSEA, values equal to or less than .06 indicate a close fit of the model, values equal to or less than .08 indicate a reasonable fit, and values higher than .10 indicate poor fit (Hu & Bentler, 1999). For CFI and TLI, values higher than .90 are considered as having a close fit (Hair, Black, Babin, & Anderson, 2009). Still in the measurement model, we presented the constructs' reliability (internal consistency) measured by Cronbach's alpha and by composite reliability (ρ). Scholars have proposed that internal consistency values above .60, preferably above .70, are adequate for scales used in social studies (Bagozzi & Yi, 1988; Nunnally & Bernstein, 1994). Regarding the individual contributions of items to their assigned constructs, we followed Stevens (1996), who has suggested that items with factor loadings less than .40 should be eliminated. We did not eliminate any item because they all loaded well above than .40. Construct validity was checked following Fornell and Larcker's (1981) procedures for assessing convergent and discriminant validity. AVE is a measure of convergent validity. We reported the AVE for each subscale, which should have a value of at least .50, indicating that the variance due to measurement error was smaller than the variance explained by the construct' indicators. As for discriminant validity, we also followed Fornell and Larcker's orientation, which determines that AVE for each construct should be larger than the squared correlation between this construct and any another construct. In the second step, to evaluate the structural model, we applied the same fit index criteria and we checked the size and significance of path coefficients.

To answer the RQ₁, we ran a MANOVA with one grouping variable (coached vs. non-coached) and a covariate (years of experience). We used the five dimensions of motivation (enjoyment, competence, appearance, health, and social relationship), three dimensions of attitudinal involvement (hedonic value, centrality, and symbolic value), three indicators of behavioral involvement (number of event participations in the last 12

months, number of practice sessions per week, and average duration of practice sessions), and commitment as the dependent variables. For each latent variable, we used the mean scores of the indicators as the surrogate value for that variable. Years of experience was the only covariate in the model, because *t*-tests comparing coached and non-coached runners in demographic variables were significant only for years of experience.

To answer the RQ₂, we conducted a multiple-group SEM. Initially, we carried out a multiple-group CFA to test the measurement invariance (Chen, Sousa, & West, 2005; Widaman & Reise, 1997). To test the measurement invariance of our first-order factor model, a series of three hierarchically nested models were tested. Model Chen et al. (2005) proposed that factor loading invariance should be enough to carry on comparisons on structural paths. To test structural invariance, we examined a series of five hierarchically nested models (Byrne, 2006) to compare the structural relationships among the constructs across groups (coached vs. non-coached): Model 1 (unconstrained model), model 2 (constrained model – all structural paths were forced to be equal for both samples), model 3 (relaxing the constraint over the path of attitudinal involvement regressed on motives), model 4 (relaxing the constraint over the path of all three behavioral involvement variables regressed on attitudinal involvement), and model 5 (relaxing the constraint over the paths of commitment regressed on all three behavioral involvement variables). As suggested in the literature (Widaman & Reise, 1997), we tested the chi square difference (Δ chi square) between two nested models to verify both the measurement invariance and the structural invariance. Still supported by the literature (Chen et al., 2005), we also compared the RMSEA and CFI of nested models.

3 Results

Results of the measurement model showed reasonable fit: CFI = .931; TLI = .916; RMSEA = .068 (90% CI: .064; .073). Convergent validity of the measures was confirmed for eight out of nine scales, considering values of AVE equal or higher than .50 (Table 1). The exception was the competence scale, which presented AVE slightly lower than .50, due to the low factor loading of the first item. We did not delete this item, because its individual contribution was significant and well above .40 (Stevens, 1996). The discriminant validity of all scales was confirmed, as the AVE of each factor was larger than the squared correlations between that factor and all other factors (Fornell & Larcker, 1981). The reliability of the measures was equally confirmed (Table 1), considering that values for internal consistency (Cronbach's α) and composite reliability (ρ) were all above .70 (Nunnally & Bernstein, 1994).

Descriptive results showed that all five proposed motives are important factors to push people to run (Table 1). On average, respondents were more motivated to run for motives of health ($M = 6.71$; $SD = 0.58$) and of enjoyment ($M = 6.27$; $SD = 0.87$). However, all motives were rated above five, the agreement point in a seven-point Likert scale. Respondents reported to be involved with running more based on hedonic values ($M = 5.97$; $SD = 1.13$), and less based on centrality ($M = 4.45$; $SD = 1.60$) and symbolic values ($M = 4.23$; $SD = 1.56$) of running. On average, they participated in six events ($SD = 5.74$) in the last 12 months, run three days ($SD = 1.21$) per week, during 55.5 minutes ($SD = 20.34$) per week. They reported to be moderately committed to running ($M = 4.98$; $SD = 1.55$). Overall, the descriptive results seem to confirm that respondents were not professional runners; rather, they run to stay healthy and for fun; and they are only moderately involved and committed to running.

 Insert Table 1 about here

3.1 Structural model

Results of the structural model showed reasonable fit: CFI = .926; TLI = .914; RMSEA = .057 (90% CI: .053; .061). Regression weights from enjoyment ($\gamma_1 = 0.72$; $p < .001$) and health ($\gamma_4 = -0.13$; $p = .009$) to attitudinal involvement were significant. The other three motives were not significant predictors of attitudinal involvement. The regression weights from attitudinal involvement to all three behavioral involvement variables were significant: to practices per week ($\beta_1 = 0.41$; $p < .001$), to duration of daily practice ($\beta_2 = 0.20$; $p < .001$), and to participation in events in the last 12 months ($\beta_3 = 0.33$; $p < .001$). The regression weights from all three behavioral involvement variables to commitment were also significant: from practices per week ($\beta_4 = 0.18$; $p < .001$), from duration of daily practice ($\beta_5 = 0.13$; $p = .004$), and from participation in events in the last 12 months ($\beta_6 = 0.29$; $p < .001$). Based on these results, the three hypotheses can be analyzed as following:

H₁: Different motives lead to different levels of attitudinal involvement with running. This hypothesis was supported. While motives of competence, appearance, and social relations did not affect attitudinal involvement significantly, motives of enjoyment (intrinsic) and health (extrinsic) were significant predictors of attitudinal involvement in different directions. For one standard deviation increase in enjoyment, the results predicted an increase of 0.72 standard deviations in attitudinal involvement. For one standard deviation increase in health motivation, the results predicted a decrease of 0.13 standard deviations in attitudinal involvement with running.

H₂: Attitudinal involvement leads to behavioral involvement with running. This hypothesis was supported. Increases in attitudinal involvement led to increases in all three behavioral involvement variables. For one standard deviation increase in attitudinal involvement, the results predicted increases of 0.41, 0.20, and 0.33 standard

deviation in practices per week, duration of daily practices, and participation in events, respectively.

H₃: Behavioral involvement leads to commitment with running. This hypothesis was supported. Increases in any of all three behavioral involvement variables led to increases in commitment to running. For one standard deviation increase in practices per week, duration of daily practices, and participation in events predicted an increase of 0.18, 0.13, and 0.29, respectively, in commitment to running.

3.2 MANOVA

The significant result of the MANOVA (Wilk's $\lambda = 0.912$; $F = 4.275$; $p < .001$; partial $\eta^2 = 0.09$; power = 1.00) and the follow-up univariate analysis (Table 2) allowed us to answer the RQ₁, as following:

RQ₁: Do coached runners differ from non-coached runners in their motives, involvement, and commitment to running? Yes. Coached runners were more motivated, involved, and committed to running than non-coached runners, in all variables investigated but two (appearance motivation and health motivation). Coached runners ran more days per week, during more time, and had participated in more running events in the last 12 months than non-coached ones.

Insert Table 2 about here

3.3 Multiple-group SEM

We tested three hierarchically nested models to verify the measurement invariance (Table 3). The chi-square difference test between model 1 (unconstrained model) and model 2 (factor loading invariant model) was significant ($\Delta\chi^2 = 106.12$, $\Delta df = 27$, $p < .001$). However, the CFI difference ($\Delta CFI = 0.007$) was less than 0.01 and the RMSEA was very close between the two models (.072 and .074), indicating that factor loadings

could be considered invariant between groups (Chen et al., 2005; Cheung & Rensvold, 2002). The chi-square difference test between model 2 and model 3 – factor loading and intercept invariant model was significant ($\Delta\chi^2 = 81.37$, $\Delta df = 27$, $p < .001$). However, once more, the difference in the CFI ($\Delta CFI = 0.004$) was less than .01, and the RMSEA was the same for both models, supporting intercept invariance (Chen et al., 2005).

Insert Table 3 about here

Results of the single-group SEM showed that the model fit the data reasonably well for both samples: coached (CFI = .916; TLI = .902; RMSEA = .060 [90% CI: .054; .065]) and non-coached runners (CFI = .924; TLI = .911; RMSEA = .060 [90% CI: .054; .066]). The chi-square difference test between model 1 and model 2 ($\Delta\chi^2 = 61.33$, $\Delta df = 11$, $p < .001$) was significant, indicating that not all structural relationships were invariant across groups (Table 4). The chi-square difference tests between model 3 and model 1 ($\Delta\chi^2 = 25.02$, $\Delta df = 6$, $p < .001$), between model 4 and model 1 ($\Delta\chi^2 = 52.36$, $\Delta df = 8$, $p < .001$), and between model 5 and model 1 ($\Delta\chi^2 = 45.39$, $\Delta df = 8$, $p < .001$) were all significant, indicating that the path coefficients vary between groups.

Insert Table 4 about here

The results of the multiple-group SEM allowed us to answer the RQ₂, as following:

RQ₂: Is the process toward commitment to running different between coached runners and non-coached runners? Yes. The path coefficients from motives to attitudinal involvement, from attitudinal involvement to behavioral involvement variables and from behavioral involvement variables to commitment varied between groups. The path

coefficient from enjoyment to attitudinal involvement was significant for both groups, but it was larger for the coached group ($\gamma_{1_coached} = 0.87; p < .001$; $\gamma_{1_non-coached} = 0.78; p < .001$). The path coefficient from health motives to attitudinal involvement was significant only for the coached group, ($\gamma_{4_coached} = -0.48; p < .001$; $\gamma_{4_non-coached} = -0.07; p = .346$). The path coefficient from attitudinal involvement to participation in events was larger for the coached group ($\beta_{3_coached} = 0.49; p < .001$; $\beta_{3_non-coached} = 0.29; p < .001$), while the paths from attitudinal involvement to duration of daily practices ($\beta_{2_coached} = 0.22; p < .001$; $\beta_{2_non-coached} = 0.31; p < .001$) and practices per week ($\beta_{1_coached} = 0.44; p < .001$; $\beta_{1_non-coached} = 0.51; p < .001$) were larger for the non-coached group. The path coefficients from all three behavior involvement variables to commitment were larger for the coached group: from participation in events ($\beta_{6_coached} = 0.34; p < .001$; $\beta_{6_non-coached} = 0.18; p = .009$), from duration of daily practices ($\beta_{5_coached} = 0.11; p = .026$; $\beta_{5_non-coached} = 0.10; p = .138$), and from practices per week ($\beta_{4_coached} = 0.20; p = .007$; $\beta_{4_non-coached} = 0.16; p = .002$). The path coefficient from duration of daily practices to commitment was significant only for the coached group.

4 Discussion

The purpose of this investigation was twofold: (a) to explore and describe the relationships between different facets of motivation, involvement, and commitment to running, and (b) to test whether recreational coached runners differ from non-coached runners in their motivation, involvement, and commitment to running. We tested five different motives as antecedents of attitudinal involvement, which was an antecedent of three behavioral involvement variables, which in turn were tested as antecedents of commitment to running. Two (enjoyment and health) out of five motives were significant indicators of attitudinal involvement. It is noteworthy that these two motives were also indicated by the respondents as the most important ones to motivate them to

run. Enjoyment was the only significant motive positively related to attitudinal involvement, indicating that the more the participants ran for fun, the more they became involved with running. Enjoyment is one of the most important motives people have to engage in active leisure activities (Alexandris, Kouthouris, & Girgolas, 2007; Martens & Webber, 2002) and to participate in running events (Funk et al., 2011). Ingledew and Markland (2008) proposed that enjoyment is a fundamental motive for maintenance of physical activity, as it has been categorized as an intrinsic motive (Alexandris et al., 2002; Ryan et al., 1997). Intrinsic motives are related to perceived competence and control, while extrinsic motives (e.g., appearance, health, and social relationship) are related to negative body image and affect (Ingledew & Markland, 2008; Martens & Webber, 2002). It should be intuitive that perceptions of control (“I do it, because I like it”) would lead to involvement. However, previous researchers have failed to establish an empirical relationship between enjoyment and involvement with running (Beaton & Funk, 2008; Funk et al., 2011).

The second significant indicator of attitudinal involvement was motives of health. Unlike enjoyment, health motives were negatively correlated with attitudinal involvement, indicating that the more people ran for health motives, the less they became involved with running. A sense of obligation may create this negative relationship (Ingledew & Markland, 2008). Previous researchers have focused on describing the importance of health motives to get engaged in active leisure activities (Alexandris, Kouthouris, Funk, & Tziouma, 2013; Markland & Ingledew, 1997; Sato, Jordan, & Funk, 2014). Nevertheless, previous scholars have not discussed the effects of such motivation on the process of not quitting the activity after some time, when barriers start to appear. To a certain extent, the initial findings of our research indicated

that intrinsic motivation (e.g., enjoyment) can evolve to attitudinal involvement with running, while extrinsic motivation (e.g., health) can have the reverse effect.

Additionally, the results showed that attitudinal involvement may evolve to behavioral involvement (i.e., number of practices per week, duration of practice sessions, and participation in running events) and behavioral involvement may lead to commitment (i.e., resistance to change running for other active leisure activity). These results illustrated the suitability of the PCM (Funk & James, 2001) to describe the process through which people pass when they get engaged with an active leisure activity. Running has demonstrated strength to move participants from the awareness/attraction stage to the allegiance stage (Funk et al., 2011; Ridinger et al., 2012). In the tested model, enjoyment was the initial motive that moved runners (a) from the attraction stage to the attachment stage and (b) from the attraction stage to the allegiance stage.

Beaton et al. (2011) used the PCM to classify marathon runners based on different stages of involvement. Their rationale was that all runners should have a certain level of involvement, which could serve as an indicator of where they would be in the continuum. For instance, those with low perceptions of any two out of three dimensions of involvement (centrality, hedonic value, and symbolic value) should be in the awareness/attraction stage of the PCM. On the other hand, those with high perceptions of any two dimensions would be in the allegiance stage. Unlike Beaton et al. (2011), in the current investigation, we did not assume that all participants already had a certain level of involvement with running, because they were amateur runners and people vary in their levels of involvement during their lifespan. In this sense, our results added to the leisure literature, as we show that the process toward commitment to an active leisure activity does not necessarily start with involvement, rather it can start at early stages,

with motivation. More specifically, considering the self-determination theory (Deci & Ryan, 1985), the process toward commitment depends on increasing intrinsic motivation (e.g., enjoyment) and decreasing extrinsic motivation (e.g., health motives).

We also explored the differences between coached and non-coached runners in their motivation, involvement, and commitment with running. Previous researchers (e.g., Funk et al., 2011) indicated the importance of investigating differences between these two groups, when they reported that an increasing number of participants in running events have been members of running clubs and have been coached in their practices. Therefore, in a population of recreational runners, we may have serious leisure and casual leisure participants (based on Stebbins' (2001) definitions). Confirming this assumption, in our sample, coached runners ran more days per week, during more time, and had participated more in running events, when compared to non-coached runners. Moreover, the results showed that coached runners were more motivated, involved, and committed to running than non-coached runners, in all variables investigated (with the exception of two motives: appearance and health). No other research was found in the literature comparing sub-groups of active leisure participants, based on psychographic characteristics. Specifically in terms of motives' differences, coached runners and non-coached runners are different in some of intrinsic motivations (enjoyment and competence) and one of extrinsic motivations (social). Eime, Young, Harvey, Charity, and Payne (2013) noticed that people look for structured sport because they aim for enjoyment and social interaction. In our sample, coached runners can be said to be participants in structured sport, because they were part of running clubs and received coaching directions to practice. Eime et al. (2013) added that participation in sport clubs enhance social connectedness of members. Besides enjoyment and social connectedness, coached runners had high levels of competence

motivation, which should not be surprising. Intuitively, when amateur athletes want to improve their competence in sports, they look for professional coaching orientation.

Finally, we tested whether the process toward commitment to running would differ between coached and non-coached runners. The results showed that the paths were variant throughout the model. The path coefficient from enjoyment to attitudinal involvement was significant for both groups, but it was larger for the coached group, while the negative path coefficient from health motives to attitudinal involvement was significant only for the coached group. Based on these results, we propose that the positive relationship between enjoyment and attitudinal involvement and the negative relationship between health motives and attitudinal involvement may be intensified when runners received coaching orientation. The path coefficient from attitudinal involvement to participation in events was larger for the coached group, while the paths from attitudinal involvement to duration of daily practices and practices per week were larger for the non-coached group, implying that coaching might have some influence on the behaviors runners choose to show their involvement. For example, coached runners tend to express their involvement with running by participating more in running events, while non-coached tend to express their involvement by running more days per week or more minutes per day. However, it is noteworthy that coached runners had higher values in all three behavior involvement variables. Additionally, practicing more time per day or more days per week did not make the non-coached runners more committed. In fact, the path coefficients from all three behavior involvement variables to commitment were stronger for the coached group. Some scholars have used involvement to describe unique characteristics of different segments of sport consumers (Funk et al., 2004; Havitz & Howard, 1995). Others have described antecedents or consequences of involvement (Funk et al., 2011; Ridinger et al., 2012). In attempt to

move research forward in the field of active leisure, we tested the influences of a market segmentation on a model that summarized antecedents and consequences of involvement.

4.1 Managerial implications

The practical effects of improving the population participation in sport and active leisure activities is already well established in the literature (Sallis et al., 2006). More recently, researches have shown that promoting serious active leisure can bring well-being benefits for participants and for communities (Lamont, Kennelly, & Moyle, 2014). Additionally, scholars have investigated the reasons why people keep running, in order to provide practical advices to runners and coaches (Yair, 1992). In this sense, transforming people from mere participants of running events into committed runners seems to have fundamental practical importance. Committed people are much less likely to quit their active leisure activities and consequently get more healthy benefits for a long period of time. Moreover, sport professionals who coach practices of committed people are more likely to have loyal clients for long terms.

In order to improve chances of transforming sporadic runners in committed runners, the first practical advice would be to focus on enjoyment. Sport managers, running coaches, and personal trainers should focus on making the practices a fun event. The initial motivation may be associated to a sense of obligation (e.g., “I run because it helps to me to drop some weight,” or “my doctor said that if I do not drop some weight I may die”). However, those who coach such people should help them to have fun in their physical activities. The reason to start does not necessarily need to be the reason to continue practicing. People can get engaged in active leisure for health motives, but when they find some sort of enjoyment in their activities, chances are that they will keep doing this for longer periods.

Besides fun, coaching plays an important role to move people toward commitment. People who receive coaching to run are more motivated, involved, and committed to running. We cannot establish a cause-effect relationship between coaching and those attitudes. That is, we cannot affirm that people become more motivated, involved, and committed to running because they receive coaching. The reverse can also be true. Disregarding the direction of the relationship, those who coach physical exercises or sports seems to play an important role in keeping people running. Local governments, schools, universities, and running clubs should be aware of this fact. Having professional running coaches available to coach practices in in their staff teams may improve chances that people will keep running and get more benefits, for a longer time. They can help runners to move from involvement to commitment with such active leisure activity.

4.2 Limitations and future research

This study has some limitations. First, although a large sample of runners had been investigated, we investigated participants of one running event only. A replication of the current study in other towns or in other countries could shed some light on the effects of cultural traits on running attitudes and behaviors. Ideally, a random sample of all runners of a certain region should be used. Second, we tested one structural model, which explained 64.9% and 68.9% of the variance in commitment to running, from non-coached and coached runners respectively. The model is theoretically sound, but it left about a third of variance in the focused dependent variable unexplained. Future scholars might consider additional variables, mainly environmental antecedents of involvement, such as socializing agents and cultural environment (as suggested by Beaton et al., 2011) – considering that we have used individuals antecedents (personal motivation) of involvement. Third, we focused on segmenting runners based on one psychographic

variable: coaching to run. Future researchers may be interested in segmenting runners based on demographic variables, such as gender, age, or marital status (as suggested by Goodsell & Harris, 2011). Even the interaction between psychographic and demographic variables to segment runners may shed new light on the process toward commitment. Fourth, we collected all data from one survey. Therefore, we understand the common method bias as a potential limitation of the study. As suggested by Podsakoff, MacKenzie, Lee, and Podsakoff (2003), we applied some procedural remedies to mitigate this bias. For example, we designed the questionnaire so that criterion and predictor variables were separated, the items were jumbled, and the respondents were guaranteed anonymity for their participation.

Despite some limitations and delimitations, results of the current investigation clarified the relationship among motives, involvement, and commitment to an active leisure activity – running. Structural relationships among such variables have not been tested before. Results indicated that motivation can progress to involvement and commitment to run, as theoretically proposed by the PCM model (Funk & James, 2001) and the self-determination theory (Deci & Ryan, 1985). Enjoyment and coaching seem to play important roles in moving people toward commitment to running.

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Table 1

Factors, items' wordings, factor loadings (λ), internal consistency (α), composite reliability (ρ), and descriptive statistics

Factors and items	λ	AVE	α	ρ	M	SD
MOTIVATION (based on Ryan et al., 1997)						
ENJOYMENT		0.58	0.78	0.79	6.27	0.87
I enjoy this activity	0.795					
I like to do this activity	0.703					
The activity is stimulating	0.789					
COMPETENCE		0.47	0.70	0.70	5.99	0.88
I like physical challenges	0.559					
I want to get better at this activity	0.738					
I want to improve existing skills	0.740					
APPEARANCE		0.76	0.90	0.89	6.00	0.98
I want to look better	0.819					
I want to improve my appearance	0.973					
I want to improve my body shape	0.819					
HEALTH		0.70	0.86	0.86	6.71	0.58
I want to live healthy	0.870					
I want to maintain physical health	0.891					
I want to be physically fit	0.734					
SOCIAL RELATIONSHIP		0.84	0.94	0.93	5.43	1.36
I like to be with others in activity	0.926					
I want to be with my friends (in running practices)	0.941					
I enjoy spending time with others doing this	0.886					

ATTITUDINAL INVOLVEMENT (based on Beaton et al., 2011)

HEDONIC VALUE		0.67	0.83	0.85	5.97	1.13
Running is fun	0.788					
Running is one of the most satisfying things that I do	0.799					
I really enjoy running	0.864					
CENTRALITY		0.72	0.88	0.88	4.45	1.60
I find a lot of my life organized around running	0.850					
Running plays a central role in my life	0.830					
Much of my time is organized around running	0.864					
SYMBOLIC VALUE		0.71	0.88	0.88	4.23	1.56
Running says a lot about who I am	0.867					
Running tells something about me	0.848					
Running gives others a glimpse of the person I am	0.816					

BEHAVIORAL INVOLVEMENT (based on Funk et al., 2011)

Number of running practices per week (days)					3.0	1.2
Average time of running practice (minutes)					55.5	20.3
Event participation in the last 12 months (events)					6.0	5.7

COMMITMENT (based on Pritchard et al., 1999)		0.64	0.83	0.86	4.98	1.55
My preference to running over other physical activities would not willing change	0.905					
It would be difficult to change my beliefs about the benefits of running	0.595					
Even if close friends recommended another sport, I would not change my preference for running	0.870					

Table 2

Univariate comparisons between coached and non-coached runners in their motives to run, involvement, and commitment to running

	Coached?	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>	Partial η^2	Power
<i>Motives</i>							
Enjoyment	No	6.18	.95	8.406	.004	.015	.825
	Yes	6.37	.72				
Competence	No	5.88	.92	5.882	.016	.011	.678
	Yes	6.07	.84				
Appearance	No	5.98	1.02	.024	.877	.000	.528
	Yes	6.02	.96				
Health	No	6.67	.68	2.288	.131	.004	.327
	Yes	6.75	.50				
Social	No	5.04	1.48	33.011	.000	.057	1.000
	Yes	5.72	1.20				
<i>Attitudinal Involvement</i>							
Hedonic Value	No	5.88	1.15	7.093	.008	.013	.758
	Yes	6.09	1.04				
Centrality	No	4.26	1.59	9.863	.002	.018	.880
	Yes	4.63	1.54				
Symbolic Value	No	4.10	1.55	4.955	.026	.009	.603
	Yes	4.37	1.50				
<i>Behavioral Involvement</i>							
Week Frequency (days)	No	3.03	1.27	4.232	.040	.008	.537
	Yes	3.18	1.08				
Session Time (min)	No	53.13	21.79	6.760	.010	.012	.737
	Yes	57.57	19.99				
Event Participation	No	6.03	6.28	5.481	.020	.010	.647
	Yes	7.05	5.77				
<i>Commitment</i>							
Resistance to change	No	4.74	1.57	14.772	.000	.026	.970
	Yes	5.22	1.47				

Table 3

Test of measurement invariance comparing three hierarchically nested models

Model	Chi-square	df	RMSEA (90% CI)	CFI	Model Comparison	Δ Chi-square	Δ df
<i>Model 1</i> Configural Invariance ^a	1442.63	576	0.072 (.068;.077)	0.923	---	---	---
<i>Model 2</i> 1st-order factor loadings invariant ^b	1548.74	603	0.074 (.069;.078)	0.916	2 vs. 1	106.116	27
<i>Model 3</i> 1st-order factor loadings and intercepts of indicators invariant ^c	1630.11	630	0.074 (.070;.079)	0.912	3 vs. 2	81.373	27

Notes. ^a Model 1 is the unconstrained model, where all parameters were freely estimated.

^b In model 2, all factor loadings were constrained to be the same for both groups. Model 2 is nested in model 1. Comparing model 2 to model 1 tests the invariance of factor loadings of items.

^c In model 3, all intercepts were constrained to be the same for both groups. Model 3 is nested in model 2. Comparing model 3 to model 2 tests the invariance of intercepts of items.

Table 4

Test of structural invariance, comparing five nested models

Model	Chi-square	df	RMSEA (90% CI)	CFI	Model Comparison	Δ Chi-square	Δ df
<i>Model 1</i> Unconstrained model	2068.49	805	0.074 (.070;.078)	0.900	---	---	---
<i>Model 2</i> Constrained model	2129.82	816	0.075 (.071;.079)	0.897	2 vs. 1	61.33	11
<i>Model 3</i> Relaxing ATT_INV on MOT	2093.51	811	0.074 (.070;.078)	0.900	3 vs. 1	25.02	6
<i>Model 4</i> Relaxing BEH_INV on ATT_INV	2120.85	813	0.075 (.071;.079)	0.897	4 vs. 1	52.361	8
<i>Model 5</i> Relaxing COM on BEH_INV	2113.88	813	0.071 (.067;.075)	0.897	5 vs. 1	45.391	8

Note. MOT = Motives. ATT_INV = Attitudinal involvement. BEH_INV = Behavioral involvement variables. COM = Commitment.

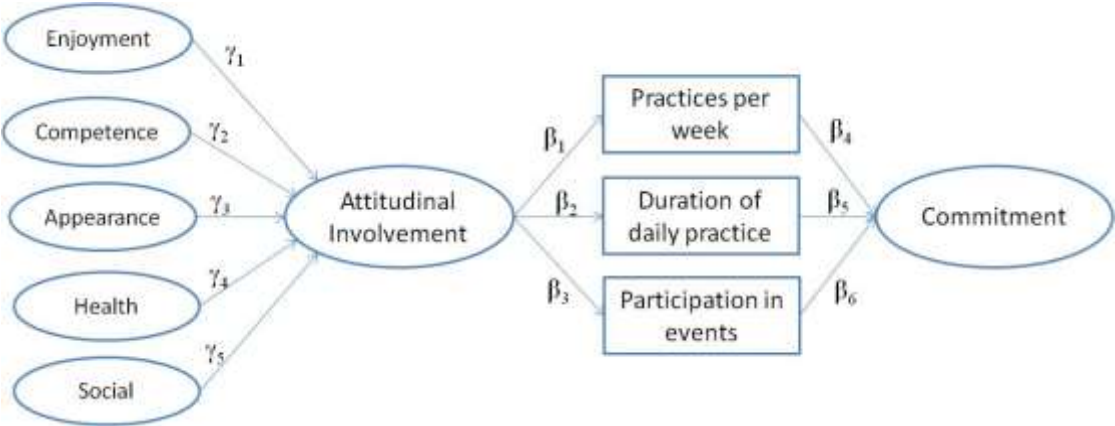


Figure 1. Structural relationships among motives, attitudinal involvement, behavioral involvement, and commitment with running