



# Testing a bi-factor model to disentangle general and specific factors of motivation in self-determination theory ☆☆☆



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## ABSTRACT

We examined the utility of the bi-factor model for disentangling general motivation and specific motivations (i.e., amotivation, external, introjected, identified, and intrinsic regulations) in relation to goal progress and physical activity (PA). Participants ( $N = 186$  undergraduate students;  $M_{\text{age}} = 19.26$  years) completed assessments of motivation and PA at Time 1. Four weeks later, PA and goal progress were assessed at Time 2. Results indicated that the exploratory bi-factor model specifying motivational regulations as the specific factors and general motivation as the general factor was a good fit to the data. Results of the structural equation model indicated that identified and intrinsic regulations and general motivation predicted concurrent PA at Time 1. A novel finding was that controlling for concurrent PA at Time 1, general motivation emerged as the only predictor of Time 2 goal progress and PA. Results highlight the importance of examining general motivation in addition to quality of motivation in tandem because general motivation emerged as the sole significant longitudinal predictor of PA outcomes.

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## 1. Testing a bi-factor model to disentangle general and specific factors of motivation in self-determination theory

'To be or not to be motivated' is a question that has attracted a large amount of theoretical and empirical attention in performance and health-related research streams (Gagné et al., 2014; Ng et al., 2012). Using self-determination theory (SDT), Deci and Ryan (2000) contend that individuals pursue activities for different reasons that reflect distinct motivations varying in quality rather than solely quantity. Across contexts, support for the assertion that motivation can be separated into specific factors of motivation that differentially predict behavior has been found (Deci & Ryan). Yet, it seems possible that an individual could have a *general motivation* that is characterized by the endorsement of multiple specific factors of motivation (Ryan, 1995). In other words, although items from SDT-based motivation scales can be regrouped into specific factors of motivation, the scores on the same items may also reflect a general factor of motivation characterizing the endorsement of multiple *reasons* for engaging in behavior. Using SDT, we contend

that the quality of motivation and general motivation are reconcilable properties of human motivation that can be unpacked and studied together within the confines of bi-factor analysis. Specific factors of motivation are part of a larger pool of motivational resources (i.e., general motivation) likely to facilitate task engagement. As such, specific and general factors of motivation are expected to be empirically distinguishable and uniquely associated with consequential outcomes. Using the context of physical activity (PA) as an example, we sought to demonstrate that specific and general factors of motivation can be differentiated to predict goal progress and PA 4 weeks later.

### 1.1. Self-determination theory

Deci and Ryan (2000) hypothesized that individuals pursue their activities for different reasons that can be portrayed using six specific factors of motivation. Questionnaires have been developed to assess the extent or the quantity of endorsement of these specific factors of motivation (Gagné et al., 2014; Mullan, Markland, & Ingledew, 1997). On theoretical grounds, these motivations or behavioral regulations are assumed to differ in quality insofar as each regulation varies based on the relative autonomy that reflects if an activity has been internalized into the self. *Amotivation* is characterized by *non-regulation* and represents a perception that the behavior will not bring about a desired outcome. Extrinsic motivation is underpinned by four specific types of regulation (external, introjected, identified, and integrated regulations).

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An individual with *external regulation* engages in behavior because of external pressure and contingency. *Introjected regulation* is characterized by an individual engaging in behavior because of internal contingencies (e.g., guilt). An individual with *identified regulation* values the behavior. With *integrated regulation* an individual fully integrates the behavior as part of their self. The third type of motivation is intrinsic motivation. When a person is intrinsically motivated they have *intrinsic regulation* and engage in behavior because there is no separable consequence other than interest and/or enjoyment (Deci & Ryan). A focus on qualitatively distinct factors of motivation provides investigators with an opportunity to understand how each distinctly predicts external variables. Thus far, however, researchers have yet to investigate whether the scores on these specific factors of motivation – and their effects on outcomes – are confounded by a more general endorsement of the six motivations for engaging in the behavior.

### 1.2. Operationalizing motivation

Various scoring procedures involving difference scores, composite scores, and relative scores have been used to operationalize motivation (see Wilson, Sabiston, Mack, & Blanchard, 2012 for a more comprehensive review). However, Chemolli and Gagné (2014) cogently outlined the pitfalls associated with using scoring procedures that combine motivations into one relative autonomy index or procedures whereby difference scores are employed because these procedures mask multidimensionality and potentially important individual differences. Furthermore, Chemolli and Gagné provided evidence to demonstrate that motivation, as conceptualized within SDT, may be best operationalized as a multidimensional construct rather than as unidimensional. Therefore, it seems preferable to score each motivation individually and account for multidimensionality rather than to create a unidimensional relative score.

Additionally, researchers have almost exclusively focused on the specific factors of motivation without taking into consideration whether scores on these factors also reflect *general motivation or an overall impetus to engage in a specific behavior*. The lack of research attention devoted to differentiating a general factor of motivation from the specific factors in SDT could be attributable to methodological limitations. Traditional factor analytical approaches are designed to optimally separate items on the basis of their conceptual distinctiveness without paying too much attention to their conceptual similarities. That is, a limitation associated with these statistical procedures is the often incorrect assumption (Reise, Bonifay, & Haviland, 2013) that the items are unidimensional insofar as they were developed to assess one construct using theory. Ample empirical evidence exists to support the tenability of a theoretically-driven model with six distinct yet correlated motivational factors (Deci & Ryan, 2000). However, more research is needed to fully explain the underlying conceptual meaning attached to the shared variance of these six specific motivational factors. A bi-factor model provides a promising platform to examine the multidimensionality of item responses and to provide an alternative to the traditional yet criticized reliance on omnibus relative autonomy indexes.

### 1.3. The bi-factor model

In a bi-factor model (e.g., Chen, West, & Sousa, 2006; Myers, Martin, Ntoumanis, Celimli, & Bartholomew, 2014) it is assumed that the covariances among item responses can be explained by one *general factor* that accounts for the common variance among *specific clusters* of items that share similar content (Reise, 2012). The general factor is thought to represent a conceptually broad factor that the instrument was developed to assess (e.g., general

motivation) whereas the specific factors capture the more narrowly defined subscales (e.g., each of the six regulations).

The bi-factor model is particularly useful for multidimensional constructs (see Chen et al., 2006; Reise, 2012; for reviews). In the past, researchers studying motivation and hypothesizing multidimensionality have examined models wherein the items are best represented by six first order regulations which are in turn, characterized by two second order factors representing autonomous and controlled motivation (e.g., Gagné et al., 2014). Although higher order models are similar, and in fact are nested within bi-factor models, the bi-factor model has several advantages (Chen et al., 2006). Arguably the most appealing advantage of bi-factor models is that both the specific and general factors can simultaneously be examined as antecedents or consequences of external variables, and therefore the multidimensionality of item responses can be more clearly elucidated (Reise et al., 2013).

Specific clusters of items may indeed differentiate six qualitatively distinct motivations. Furthermore, each item may also tap a common content that reflects a general motivation to engage in a specific behavior. Deci and Ryan have focused their attention on the different qualities of motivation. However, Ryan (1995) reiterated the importance of the quantity of one's motivation. Someone with a score of 7 on introjection might be as 'motivated' as someone with a score of 7 on identified motivation. Yet, on phenomenological grounds, these two motivations are likely to be experienced differently by the two individuals. One is engaged in the behavior with a sense of pressure whereas the other is engaged with a sense of volition and autonomy. Despite their different quality or phenomenological properties, the scores on the specific factors of motivation could equally reflect a more general predisposition to endorse and be motivated for a particular activity.

### 1.4. Purpose

The first purpose of this short-term longitudinal study was to examine if motivation can be operationalized as a bi-factor model representing specific factors that characterize different *qualities* of motivation (i.e., amotivated, external, introjected, identified, and intrinsic regulations) and a general factor that characterizes general motivation. The second purpose was to determine if the general factor of motivation above and beyond the specific factors of motivation predicts concurrent PA (Time 1) and also goal progress and PA 1 month later (Time 2). PA was selected as the context of interest because through their Global Strategy to Promote Health, the World Health Organization (World Health Organization, 2004) has identified research on PA as one of four primary objectives given that it is a preventive factor for diseases (e.g., cardiovascular, diabetes, obesity). Furthermore, it has been argued that PA is a good context to test tenets of SDT given that PA often requires effort and perseverance (Standage & Emm, 2014; Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Finally, it is possible for someone to be less physically active than the PA guidelines while nonetheless attaining their personal PA goal. It is also common for someone who is more physically active to not make progress in the pursuit of their personal goals (see Dugas, Gaudreau, & Carraro, 2012). As such, we measured the amount of PA and the progress made in the pursuit of a PA goal to offer a complementary perspective in investigating PA outcomes.

## 2. Method

### 2.1. Procedures and participants

English speaking participants were recruited from an introductory psychology participant pool at the University of Ottawa in

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