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Testing the Relationships Between Global, Contextual, and Situational Motivation: A Longitudinal Study of the Horizontal, Top-down, and Bottom-up Effects☆

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A B S T R A C T

The hierarchical model of intrinsic and extrinsic motivation establishes three levels of generality to analyze human motivation (global, contextual, and situational). The dynamism of motivation is explained by means of the relations between the three levels. The purpose of this study is to test the reciprocal effects, top-down and bottom-up, between one motivational level and the adjacent level, as well as the stability of the global level (horizontal effect). A longitudinal design with six measurement time points across a 4-month interval was used. Participants were 142 undergraduate students. Results from path analysis using a Bayesian estimation method provided support for our hypotheses. Finally, the implications of the dynamic processes of influence among the hierarchical levels in academic setting are discussed.

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Probando las relaciones entre la motivación global, contextual y situacional: un estudio longitudinal de los efectos horizontal, arriba-abajo y abajo-arriba

R E S U M E N

El modelo jerárquico de la motivación intrínseca y extrínseca establece tres niveles de generalidad para analizar la motivación humana (global, contextual y situacional). El dinamismo de la motivación se explica de acuerdo a las relaciones entre estos niveles. El objetivo de este estudio es probar los efectos recíprocos, arriba-abajo y abajo-arriba, entre cada nivel motivacional y su adyacente, así como la estabilidad del nivel global (efecto horizontal). Se llevó a cabo un diseño longitudinal durante un periodo de cuatro meses. Los participantes fueron 142 estudiantes universitarios. Los resultados del *path analisis*, utilizando un método de estimación bayesiano, apoyaron las hipótesis planteadas. Finalmente, las implicaciones de los procesos dinámicos de influencia entre los niveles jerárquicos son discutidas en el contexto académico.

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Introduction

The variety of interests and ages comprising the university educational stage, with the corresponding changes inherent to the life span, frequently causes difficulties maintaining an adequate learning level adapted to the demands of the educational phase. In addition, the dropout rates occurring in the university setting indicate that we are faced with a problem that should be addressed from different points of view. In Spain, an average of 19% of the students drop out of the university (Ministry Education, Culture

and Sports, 2013), whereas the average in the rest of the countries of the European Union exceeds 12%. Therefore, it is important to address a problem of this magnitude and to attempt to identify the elements that favor persistence in the academic setting. The self-determination theory (SDT) and the hierarchical model of intrinsic and extrinsic motivation (HMIEM) are two theories that provide a more holistic and dynamic explanation of human motivation, analyzing the motivational processes of change over time, and generating practical solutions to this issue. Hierarchical models propose that the stability of components varies according to their levels of generality (Shavelson, Hubner, & Stanton, 1976). The HMIEM uses this knowledge as a starting point to elaborate its own postulates.

Self-determination theory

Human reality is so complex that it needs a multidimensional explanation to address the greatest possible range of behaviors. Accordingly, SDT (Deci & Ryan, 1985, 2017), holds that there are different types of motivation to explain human behavior: intrinsic motivation, extrinsic motivation, and amotivation. These types of motivation are placed on a self-determination or autonomous continuum, ranging from self-determination to lack of control (Deci & Ryan, 1991, 2000). In academic context, the students who engaged in learning activities willingly, without expectative of reinforcement but just for the pleasure and satisfaction of learning new things would have an autonomous motivation, in contrast those who engaged in learning activities pressured by internal or external forces would have a controlled motivation (Deci, 1975; Ryan & Deci, 2000a).

Intrinsic motivation reflects the highest degree of self-determination and autonomous motivation. The students engage voluntarily in the learning process, that is, the individual is origin of his or her actions. This type of motivation is considered as a sign of competence and self-determination (Deci & Ryan, 1985; Ryan & Deci, 2000a). Intrinsic motivation promote high-quality learning and creativity (Ryan & Deci, 2000b). Recently, has been showed that is the only type of motivation that is consistently associated with academic performance over a period of one year (Taylor et al., 2014).

Extrinsic motivation reflects to doing something as a mean to an end because it leads to a consequence (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). It is a multidimensional construct in which there are different types of motivation from the lowest to the highest level of self-determination: external regulation, and introjected regulation, being the two controlled types of motivation; identified regulation, and integrated regulation, which are autonomous motivations (Ryan & Deci, 2000a). External regulation implies more controlled and less autonomous behavior, and refers to engagement in an activity to gain rewards or to avoid punishment. Introjected regulation refers to the behaviors that are internalized by the person, implying internalizing regulation but not accepting it as part of oneself. The behavior is energized by factors such as an avoidance of shame, contingent self-esteem, and ego-involvement. Identified regulation is more autonomous on this continuum, in which the individual values the behavior and considers it important. Such regulation leads to autonomous behaviors because the subject freely chooses to perform the action. However, the decision to participate in the activity occurs due to external benefits and not for the sake of the satisfaction inherent in the activity itself. Lastly, integrated regulation, in which there is coherence between the behavior and the needs of the self, is the most autonomous form of extrinsic motivation. Amotivation is the last concept postulated by SDT, referring to the lack of intentionality and, therefore, the absence of motivation, either intrinsic or extrinsic. Amotivated people have feelings of incompetence, helplessness, and loss of control (Deci & Ryan, 1985; Vallerand & Ratelle, 2002).

The hierarchical model of intrinsic and extrinsic motivation

The HMIEM builds its hypotheses on SDT in order to explain the organization among constructs at different levels of generality. HMIEM is a model that allows the holistic comprehension of motivation within the educational setting. In addition, this model explains the changes in motivation occurring in the individual over time. For this purpose, it establishes a vertical hierarchy of human motivation. Accordingly, the different types of motivation (i.e., intrinsic, extrinsic, and amotivation) can be analyzed as a function of three levels of generality: global, contextual, and situational.

The highest level is the so-called global level. At this level of the hierarchy, the individual has developed a general motivational orientation to interact with the environment intrinsically, extrinsically, or amotivationally. Motivation at the global level is the most stable, acting as a personality trait. The next level is the contextual level. The word "context" is used to refer to a sphere of human activity and, although there are different contexts in an individual's life, research has revealed that the three most important are: education, leisure, and interpersonal relations (Blais, Vallerand, Brière, Gagnon, & Pelletier, 1990). Individuals develop moderately stable motivational orientations toward each context, in which social factors may have an impact. Contextual motivation is less stable over time, compared to global motivation (Guay, Mageau, & Vallerand, 2003). Finally, the situational level is the most specific. The study of motivation at the situational level is an attempt to understand why individuals engage in a concrete activity at a given time. It is assumed that motivation at this level is unstable due to its enormous sensitivity to environmental factors.

Distinguishing these three hierarchical levels is important in order to address the determinants and consequences of behavior. This is the horizontal organization of the hierarchical model. At each of the three levels of generality, motivation (i.e., intrinsic, extrinsic, amotivation) is determined or influenced by social factors that are present in the immediate context of each person. Finally, the horizontal sequence ends with the motivational consequences. In other words, the consequences of each type of motivation are different and they occur at each of the three levels of generality. These consequences can be affective, cognitive, and behavioral. At all levels of generality, intrinsic motivation and the types of more self-determined extrinsic motivation generate more positive and healthy consequences. There is sufficient empirical support for this assumption, such as that provided by the study of Vallerand and Blanchard (1998).

This distinction of hierarchical levels is essential to understand a student's motivation at a certain time and to propose the most adequate intervention in each case. For example, it is important to identify whether individuals study to obtain rewards or avoid a punishment in order to establish a series of strategies to lead them to study in the future in a more self-determined way. If only their global motivation is attended to, the wrong strategy might be chosen and relevant aspects might be neglected.

The three levels of generality are dynamically related. The study of the elements underlying the relation among the diverse levels leads to better understanding the changes in motivation an individual may undergo over time (Vallerand, 2007). Thus, motivation at one level of the hierarchy may affect motivation at another level. Top-down effects (TD) refers to the influence of motivation of a higher level on the motivation of a lower level (e.g., global on contextual motivation or contextual on situational motivation). In addition, motivation of a lower level can influence the motivation of a higher level, thus revealing the bidirectional relation existing
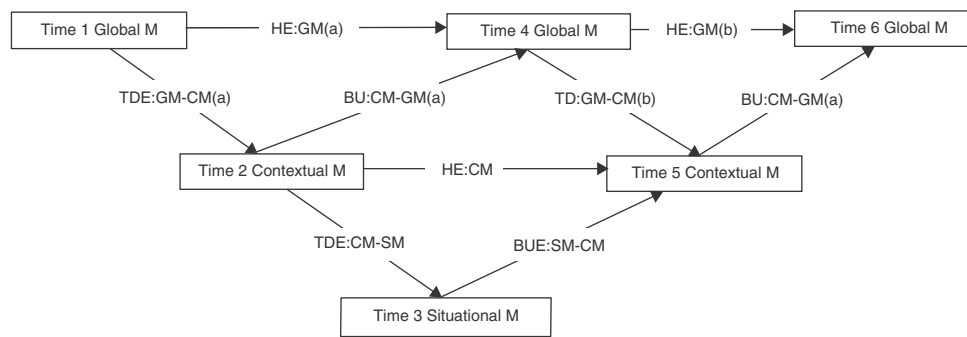
Figure 1. Hypothesized model.
Note. BU:CM-GM: bottom-up effect:contextual motivation to global motivation, BUE:SM-CM: bottom-up effect:situational motivation to contextual motivation, HE:CM: horizontal effect:contextual motivation, HE:GM: horizontal effect:global motivation, M: motivation, TDE:CM-SM: top-down effect:contextual motivation to situational motivation, TDE:GM-CM: top-down effect:global motivation to contextual motivation.

between the adjacent levels of the model. For example, repeated experiences of intrinsic motivation at the situational level should, over time, lead to developing intrinsic contextual motivation. Likewise, the existence of self-determined motivation in various life contexts should have positive effects on global motivation. This fact was described by Vallerand (2001) as recursive or bottom-up effects (BU).

These effects have received research support in different contexts. In the academic context, Guay et al. (2003) found TD and BU effects between global motivation and contextual motivation with a longitudinal design over a 5-year period. In this same context, Ntoumanis and Blaymires (2003) showed that contextual motivation significantly predicted students' situational motivation. In the sport context, Blanchard, Mask, Vallerand, de la Sablonnière, and Provencher (2007) reported TD and BU effects between contextual motivation, and situational motivation in two longitudinal studies. Lavigne et al. (2009) observed evidence of the TD and BU effects between contextual and situational motivation in two longitudinal studies with practitioners of physical activity and with high school students. Lavigne and Vallerand (2010) showed the effects TD and BU in an academic setting. In this case, situational motivation toward scientific activity was determined by the influence of contextual motivation (TD), and repeated experiences of self-determined situational motivation generated changes in the contextual motivation (BU) of high school students.

As can be seen, few studies have tested the effects of the dynamic relation among the diverse levels of generality in the academic setting, and those that have done so have only taken into account two levels of generality. No studies have tested the relation among the levels considering the three levels of generality described by the HMIEM in a longitudinal design.

The present study

This paper attempts to provide evidence of the relation among the three levels of generality of human motivation postulated by the HMIEM (i.e., global, contextual, and situational). The goals were to test the relations among the three levels of generality in a longitudinal study and to check the stability of the global level over time in the academic context. It was hypothesized that global motivation predicts changes in contextual motivation, and that contextual motivation predicts changes in situational motivation over time (TD effects). In turn, situational motivation predicts changes in contextual motivation, and contextual motivation predicts changes in global motivation (BU effects). Lastly, it was hypothesized that the

global level is more stable than the contextual level (horizontal effects).

The longitudinal study was conducted at six time points (Figure 1) over a 4-month period, from September 2013 to January 2014. Thus, global motivation was assessed three times, contextual motivation twice, and situational motivation, once. The TD effect took place at three moments of the study: global motivation at Time 1 positively predicting contextual motivation at Time 2, contextual motivation at Time 2 positively predicting situational motivation at Time 3, and global motivation at Time 4 positively predicting contextual motivation at Time 5. In turn, the recursive effect or BU also took place at three moments: contextual motivation at Time 2 positively influencing global motivation at Time 4, situational motivation at Time 3 positively influencing contextual motivation at Time 5, and contextual motivation at Time 5 positively influencing global motivation at Time 6. The present study allows determining the dynamic process of influence among three levels of generality of motivation in the university setting.

Method

Participants

Participants belonged to the first academic year of two degrees taught at the University of Las Palmas de Gran Canaria. It was decided that the participants were new students at the university who had no previous experience or prejudices in the accomplishment of tasks in the university academic context. Students were recruited from different classes without compensation. A total of 158 students participated at Time 1, 167 at Time 2, 117 at Time 3, 168 at Time 4, 107 at Time 5, and finally, 165 at Time 6. Data from students who did not complete the instrument at Time 1 or only completed it at Time 1 but did not complete the rest of the instruments were discarded, so the final participants were 142 students with a mean age of 19.53 years ($SD = 3.55$).

Measures

To analyze scale reliability, bearing in mind that the instruments used in this study are Likert scales, students' answers were ordered categorically. So, following Zumbo, Gadermann, and Zeisser (2007) recommendations, we treated data as categorical data and computed McDonald's total ordinal omega, instead of Cronbach's alpha

because of its higher accuracy (Revelle & Zinbarg, 2009). The calculations were conducted with package "psych" 1.4.2.3 of R 3.0.3.

Global motivation

Students' global motivation was assessed using the Spanish version (Núñez, Grijalvo, Fernández, & Martín-Albo, 2013) of the *Global Motivation Scale* (GMS; Guay, Blais, Vallerand, & Pelletier, 1999). This instrument has 28 items, 4 items per subscale, which assess reasons for doing things in general (i.e. In general, I do things...). The scale assesses intrinsic motivation toward knowledge (e.g.... for the pleasure of acquiring new knowledge), stimulation (e.g.... in order to feel pleasant emotions), and accomplishment (e.g.... because of the pleasure I feel outdoing myself, three types of extrinsic motivation—identified (e.g.... in order to help myself become the person I aim to be), introjected (e.g.... because I force myself to do them), and external regulation (e.g.... in order to attain prestige)—, and amotivation (e.g.... even though I do not have a good reason for doing them). Items are scored on a 7-point Likert scale from 1 (*does not correspond at all*) to 7 (*corresponds completely*). For these scale factors McDonald's Omega and average variance extracted (AVE) at Time 1 ranged from .62 and .31 to .92 and .75, at Time 4 it ranged from .79 and .52 to .96 and .85. Finally, at Time 6 it ranged from .78 and .48 to .94 and .81.

Contextual motivation

We used the Spanish version (Núñez, Martín-Albo, & Navarro, 2005) of the *Academic Motivational Scale* (AMS; Vallerand, Blais, Brière, & Pelletier, 1989), which has 28 items that respond to the question "Why do you go to university?" Items are distributed in seven 4-item subscales: three measuring *intrinsic motivation*: to know (e.g. Because I experience pleasure and satisfaction while learning new things), to accomplish (e.g. For the pleasure I experience while surpassing myself in my studies), and stimulating experiences (e.g. For the pleasure that I experience when I read interesting authors), three subscales measuring *extrinsic motivation*: identified (e.g. Because this will help me make a better choice regarding my career orientation), introjected (e.g. To show myself that I am an intelligent person) and external regulation (e.g. In order to obtain a more prestigious job later on), and a subscale that measures *amotivation* (e.g. I don't know; I can't understand what I am doing in university). The AMS is rated on a 7-point Likert-type scale, ranging from 1 (*does not correspond at all*) to 7 (*corresponds exactly*). For these scale factors McDonald's Omega and AVE at Time 2 ranged from .72 and .41 to .92 and .73, while at Time 5 it ranged from .80 and .57 to .96 and .85.

Situational motivation

We used the Spanish version (Martín-Albo, Núñez, & Navarro, 2009) of the *Situational Motivation Scale* (SIMS; Guay, Vallerand, & Blanchard, 2000), which has 16 items that respond to the question: "Why are you performing this task/activity at this time?" This scale assesses the dimensions of *intrinsic motivation* (e.g. Because I think that this activity is interesting), *identified regulation* (e.g. Because I am doing it for my own good), *external regulation* (e.g. Because it is something that I have to do), and *amotivation* (e.g. I do this activity but I am not sure if it is worth it) in a specific situation. Each one of the items responds to the question: "Why are you performing this task/activity at this time?" and is rated on a Likert-type scale, ranging from 1 (*does not correspond at all*) to 7 (*corresponds exactly*). For these scale factors McDonald's Omega and AVE ranged from .82 and .56 to .93 and .77.

Self determination index

For a more parsimonious measure of self-determination, an index has frequently been used that includes the different types of motivation in a single score of the individual's level self-determination (Ullrich-French & Cox, 2009). This index has been called *self-determination index* (SDI) and it is calculated by assigning a specific weight (according to its position along the self-determination continuum) to the score of each type of motivation, and adding them to obtain a single score. This index has been primarily used in path analysis in order to reduce the degrees of freedom of the model and to obtain satisfactory fit indices with not very large sample sizes. Thus, SDI provides information on the quality of motivation, considering that more self-determined forms of motivation lead more strongly to achieving positive outcomes. This strategy underlies the interactional hypothesis (Vallerand & Fortier, 1998) according to which intrinsic and extrinsic motivation are not independent constructs, and it supports a simplex model of the continuum of self-determination.

In order to use a single motivation score, we averaged each measure to compute the SDI for global and contextual motivation with the formula: 2*(IM knowledge + IM accomplishment + IM stimulation)/3 + 1*(identified regulation) − 1*(external regulation + introjected regulation)/2 − 2*(amotivation) previously used by Guay et al. (2003). Similarly, a situational SDI was constructed with the formula: 2*(situational intrinsic motivation) + 1*(situational identified regulation) − 1*(situational external regulation) − 2*(situational amotivation), utilized by Blanchard et al. (2007) and Lavigne et al. (2009).

Procedure

The questionnaires were administered individually during class time on six occasions by two researchers. The evaluations of this study were carried out over the first semester of 2013/14 academic course, from September 2013 to January 2014 (i.e., four-month period). The researchers explained to the students that the purpose of the study was to determine university students' motivational changes over time. Consent of all the participants was obtained. They also were informed that participation was voluntary and confidential, and we urged them to respond to the questionnaires as honestly as possible. In this sense, their responses would not be available to their teachers. A researcher was present during all the applications of the instruments and provided students with any help needed to successfully complete the questionnaire when so required.

Data collection was done without an explicit call. The participants agreed to give us the last four digits of their DNI number to participate in the follow-up study. The first meeting between the students and the experimenter took place during the second week of September 2013 (first week of the academic course) to complete the first questionnaire, the GMS (Time 1). Four weeks later, the students completed the AMS (Time 2). One month later, they completed the SIMS (Time 3) immediately after taking part in a seminar in the classroom consisting of a practical activity based on the theoretical contents taught in the subject of educational psychology. Specifically, students watched a video with daily life scenes between parents and children. Later, the students identified and explained different aspects of behavioral learning they observed (e.g. types of reinforcements and their effects, types of punishments and their effects, reinforcement programs, types of behavioral learning). One week later, the students completed the GMS for the second time (Time 4). Four weeks later, they completed the AMS for the second time (Time 5). Finally, in the third week of

Table 1
Regression parameters' value from previous studies

	HE:GM	HE:CM	TDE:GM-CM	TDE:CM-SM	BU:CM-GM	BUE:SM-CM
Blanchard et al. (2007): Study 2		.13		.17		.32
		.06		.23		.24
Guay et al. (2003)	.62	.61	.10		.10	
		.42				
Lavigne and Vallerand (2010)		.59		.36		.34
				.37		.14
Lavigne et al. (2009): Study 1		.18		.36		.37
Mean	.62	.33	.10	.30	.10	.28

Note. BU:CM-GM: bottom-up effect:contextual motivation to global motivation, BUE:SM-CM: bottom-up effect:situational motivation to contextual motivation, HE:CM: horizontal effect:contextual motivation, HE:GM: horizontal effect:global motivation, TDE:CM-SM: top-down effect:contextual motivation to situational motivation, TDE:GM-CM: top-down effect:global motivation to contextual motivation.

January of 2014, they completed the GMS for the third time (Time 6).

Data analysis

Preliminary analyses

Regarding missing data, we used full information maximum likelihood estimation method (FIML) as implemented in Mplus 7.11. Because FIML relies on data missing completely at random (MCAR) or, at least, missing at random (MAR), we performed the Little and Rubin Test (2002). Moreover, students' data who did not complete the GMS at Time 1, or only completed the GMS at Time 1 but not the rest of the instruments were discarded, so we had a final sample of 142 undergraduate students. We performed Student's *T*-test to determine possible significant differences between the final sample of students and the discarded students in all the variables used at the six time points. Concerning descriptive analyses, we computed mean, standard deviations, and Pearson's correlations between all the variables.

Path analysis

To estimate the hypothesized effects (Figure 1) taking into consideration previous studies, we ran a path analysis using a Bayesian estimation method (Muthén & Asparouhov, 2012). Van de Schoot et al. (2014) describe some advantages of using Bayesian methods: one can incorporate previous knowledge from other studies, as we do in herein, and one can update knowledge instead of testing the same hypothesis, and not focus only on significance, but on prediction accuracy. Additionally, sample size can be smaller and non-normal parameters estimated more accurately.

This estimation procedure requires setting priors based on previous studies that have analyzed similar aspects. Four studies have used the SDI to explore the TD and BU effects. For example, Blanchard et al. (2007) performed a study in which they measured contextual motivation three times, observing that the effect of contextual motivation at Time 1 on contextual motivation at Time 2 was β = .13, and at Time 2 on Time 3, it was β = .06. In Table 1, we present the regression parameters found in the following studies (Blanchard et al., 2007; Guay et al., 2003; Lavigne et al., 2009). We set prior mean to the regression's mean of the four studies and for variance, we used .20 when we had little previous information (only one study) and .02 when we had more previous information (five or more studies).

To compare the stability between the global and contextual horizontal effects, we determined whether the horizontal effect between global motivation at Time 1, Time 4, and Time 6 was different from the horizontal effect between contextual motivation at Time 2 and Time 5. Because there are two horizontal effects at the global level (see Figure 1) and one horizontal effect at the

Table 2
Mean, standard deviation, and Pearson's correlation

	M	SD	1	2	3	4	5
1. GMT1	6.57	3.50					
2. CMT2	6.80	3.50	.30				
3. SMT3	8.54	4.80	.10	.32			
4. GMT4	6.51	3.69	.55	.56	.18		
5. CMT5	6.38	3.66	.21	.31	.32	.39	
6. GMT6	6.50	3.61	.33	.38	.22	.61	.62

Note. CMT2: contextual motivation at Time 2, CMT5: contextual motivation at Time 5, GMT1: global motivation at Time 1, GMT4: GLOBAL motivation at Time 4, GMT6: global motivation at Time 6, SMT3: situational motivation at Time 3.

contextual level, we performed two model comparisons. One between the specified model and a model with the parameters from global motivation at Time 1 to global motivation at Time 4, and another from contextual motivation at Time 2 to contextual motivation at Time 5 constrained to the same value. The other model comparison was between the specified model and a model with the parameters of global motivation at Time 4 to global motivation at Time 6 and of contextual motivation at Time 2 to contextual motivation at Time 5 constrained to the same value. To determine which model fit better, we used the Bayesian information criterion (BIC) and the deviance information criterion (DIC).

Results

Preliminary analyses

Regarding attrition rate, no significant differences on all variables relevant to the present study were found between the final sample and the students who were removed. Moreover, results from the Little and Rubin test display evidence of MCAR [$\chi^2(64) = 61.00$; $p = .583$].

Means ranged from 6.38 (*contextual motivation* at Time 2) to 8.54 (*situational motivation* at Time 3), respectively, whereas standard deviations ranged from 3.50 (*global motivation* at Time 1) to 4.80 (*situational motivation* at Time 3), respectively (see Table 2).

Path analysis

As can be seen in Figure 2, global motivation at Time 1 had a positive effect on *global motivation* at Time 4, β = .42 [.28, .55], and on *contextual motivation* at Time 2, it was β = .30 [.14, .43]. The effect of *contextual motivation* at Time 2 on *global motivation* at Time 4 was positive, β = .44 [.27, .57]. The horizontal effect of *contextual motivation* at Time 2 on *contextual motivation* at Time 5 was β = .06 [−.14, .23], and on *situational motivation*, it was β = .32 [.18, .45]. *Global motivation* at Time 4 had a positive effect on *global motivation* at Time 6, β = .44 [.30, .54], and on *contextual motivation* at Time 5,

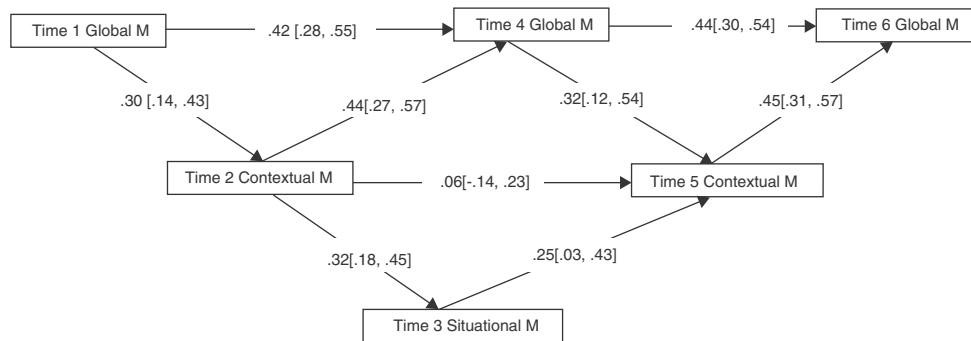**Figure 2.** Results of the path analysis.

it was β = .32 [.12, .54]. Finally, the effect of *contextual motivation* at Time 5 on *global motivation* at Time 6 was positive, β = .45 [.31, .57].

To determine whether the horizontal global effect was different from the contextual effect, we performed the model comparisons explained in the data analysis section. For the specified model, BIC = 3018.80 and DIC = 2955.10. For the model with the horizontal effect between *global motivation* at Time 1 and at Time 4 and the horizontal effect between *contextual motivation* at Time 2 and at Time 5 constrained to the same values, BIC = 3027.44, and DIC = 2969.96: For the model with the horizontal effect between *global motivation* at Time 4 and at Time 6 and the horizontal effect between *contextual motivation* at Time 2 and at Time 5 constrained to the same values, BIC = 3026.70, and DIC = 2969.08. Hence, the model without constraints had a better fit in both comparisons.

Discussion

Several studies have investigated motivational processes at three levels of generality, in different life contexts. However, few of these studies have tested how these various motivational levels interact with each other in an academic context. The present research provides reasonable support for a reciprocal relation between global, contextual, and situational motivation in first-year university students. The main goal was to test the dynamic relations among the three levels of generality in a longitudinal study. Specifically, we proposed the following hypotheses: global motivation predicts changes in contextual motivation, and contextual motivation predicts changes in situational motivation over time. In turn, situational motivation predicts changes in contextual motivation, and contextual motivation predicts changes in global motivation over time. Lastly, the global level is more stable than the contextual level, according to the tenets of Vallerand (1997).

The findings showed that global motivation assessed the first week of the academic course is a predictor of academic motivation assessed four weeks later. Such contextual motivation positively affects students' situational motivation assessed one month later, and which is experienced by means of a practical task in class. In addition, there is a positive influence of global motivation assessed at Time 4 on contextual motivation assessed at Time 5. Therefore, the hypothesized TD effects are shown.

Results revealed that academic motivation is explained in part by a specific experience carried out in class five weeks before. Accordingly, this shows the importance of situational motivation as a determinant of changes in contextual motivation as a function of the novelty of the academic context (Lavigne et al., 2009). In addition, students' contextual motivation positively affects global motivation on both the occasions in which this effect was tested in the hypothesized model. Therefore, the BU effects are also shown.

Finally, we also observed evidence of the last hypothesis. The results of the path analysis and the two model comparisons indicate that global motivation is more stable than contextual motivation. The two confidence intervals (CI) of the horizontal effects produced between the global motivations assessed are positive, whereas the CI of the horizontal effect occurring in academic motivation between Time 2 and Time 5 is not above 0. This result provides support for Vallerand's (1997) hypothesis on stability. However, it should be noted that the path between Time 2 and Time 5 contextual motivations was found to be non-significant. This result is consistent with the findings of Blanchard et al. (2007) with a sample of 150 collegiate basketball athletes, and Lavigne et al. (2009) whose participants were adults who were starting a fitness program. In both cases, the contextual motivation had low stability with intervals of few months. According to the explanation of Lavigne et al. (2009), this finding is likely due to the novelty of the university context for the sample used. It is also possible that contextual motivation is a scarcely stable construct with interval of 2–4 months.

In general, results provide support for the motivational sequence postulated by the HMIEM (Vallerand, 1997) and are in line with past research revealing the interaction between the different levels of the motivational hierarchy (Blanchard et al., 2007; Guay et al., 2003; Lavigne et al., 2009; Lavigne & Vallerand, 2010; Ntoumanis & Blaymires, 2003; Vallerand, 1997; Williams, Grow, Freedman, Ryan, & Deci, 1996).

Educational implications

Results from this research are a significant contribution to the field of education. This is the first longitudinal study in which the relations among the three levels of generality are tested in an academic setting. The dynamic interaction is very relevant because, if the teacher encourages self-determined motivation at the contextual level (e.g., generating a classroom climate that satisfies the basic psychological needs: autonomy, competence, and relatedness), on the one hand, this will lead to concrete experiences of self-determined motivation in a specific situation (Ntoumanis & Blaymires, 2003) and, on the other hand, students' general motivation to interact with their setting will also be more self-determined. The self-determined motivation at the contextual level has important educational consequences like to predict the student's basic competences (Moreno-Murcia, Ruiz, & Vera, 2015), and to lead to greater critical thinking and information processing (León, Núñez, Ruiz-Alfonso, & Bordón, 2015). Moreover, these findings suggest that motivation to study in the university will be more self-determined if the student has experiences of self-determined situational motivation. Positive situational experiences may be essential for students to develop an interest in academic activity and to be able to integrate the activity within the self (Blanchard

et al., 2007). In this sense, schools and teachers should design practical tasks of self-determined situational motivation in their classes.

Limitations and future perspectives

The present study presents some limitations that should be taken into consideration for future research. Firstly, the sample was made up of first-year undergraduate students, so that generalization of the results in the academic setting is limited; it is important to test the proposed hypotheses in other populations of students of different educational levels or in non-novice university students. In addition, to validate the results, it is necessary to test the relations among the three levels of generality in other life contexts (e.g., sports, leisure, work, and interpersonal relationships). Second, although Bayesian estimation methods are more accurate than Maximum Likelihood or Least Squares using small samples, in this study there were not many students, so it would be of interest to test the horizontal TD and BU effects with larger samples (Van de Schoot et al., 2014). Third, in the present study, we used a longitudinal design over a 4-month period. It would be interesting to examine the validity of the tested effects over a longer period. Finally, if repeated experiences of self-determination during a specific situation influence students' academic motivation (Vallerand, 1997), it may be of great interest to test a model in which situational motivation is assessed on several occasions, and to analyze its influence on contextual motivation over time. The model proposed in this study also had the goal of testing the vertical organization of the hierarchical model. Future research could take into account the goal of testing the horizontal organization of the model incorporating social factors, mediators (i.e., autonomy, competence, and relatedness), and motivational consequences (e.g. affective, cognitive, behavioral).

Since the relationship between the three levels of generality in the educational context has not been described previously, the present study provides evidence that the relationships among motivations at proximal levels in the hierarchy are reciprocal; there is a mutual influence of one level on the other over time. Therefore, the vertical hierarchy proposed by the HMIEM is confirmed, and the hypothesized model explains the dynamic interaction among the three different levels of motivation in an academic context.

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