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## Academic engagement: A diary study on the mediating role of academic support

### Abstract

Based on the Job Demands-Resources (JD-R) model, this diary study investigated the mediator role of academic resources in the relationship between personal resources and variables of well-being. The study postulates that the perceived level of academic support received by students during the day mediates the relationship between the levels of self-efficacy and curiosity, measured early in the day, and the level of academic engagement measured at the end of the day. Ninety-four participants filled in a general questionnaire and subsequently completed a daily questionnaire, for 5 consecutive academic days (470 diary entries). The multilevel analysis showed a positive relationship between self-efficacy and curiosity and academic engagement. In addition, the results revealed a positive relationship between academic support and academic engagement. Finally, the results showed partial mediation of academic support in the relationship between self-efficacy and engagement and in the relationship between curiosity and engagement.

*Keywords:* self-efficacy; curiosity; academic support; academic engagement; diary study.

## 1. Introduction

Interest in the psychological well-being and performance of individuals who are in the process of vocational training has increased in recent years. The challenges of the global economic context demand academic excellence in studies, positive psychological capacities, and engagement in the search for competitive advantages (Siu, Bakker, & Jiang, 2014). In this scenario, diary studies on the positive (e.g., engagement) and negative processes (burnout, exhaustion) of well-being in the academic context have recently gained importance (Bakker, Sanz, & Kuntze, 2015; Authors et al, 2017; Siu et al., 2014).

The study of these phenomena in the academic field is supported from a psychological perspective by the comparability of student activities in the university and job activities performed by a worker in an organization. Like workers, students also belong to organizations (universities), they perform activities that require effort, are under supervision/guidance and are evaluated according to their performance (Bresó & Salanova, 2009).

In the academic context, the literature on processes of well-being has identified engagement as a relevant variable associated with academic motivation and various positive outcomes, such as higher educational aspirations, persistence in educational pathways and lower levels of academic withdrawal (Ketonen et al. 2019). Engagement includes motivational and behavioural aspects that are beneficial for learning and adaptation of the individual in an academic context (Salmela-Aro, Moeller, Schneider, Spicer & Lavonen, 2016; Wang, Chow, Hofkens, & Salmela-Aro, 2015). Engaged students are intrinsically motivated to learn, regularly attend classes and participate in academic activities. They are also curious, willing to embrace learning challenges and have more energy to study (Salanova, Schaufeli, Martínez, & Bresó, 2010).

Academic engagement is defined as a positive state that comprises vigor, dedication, and absorption in learning (Siu et al., 2014). This state is represented by the dimensions of energy and identification. Most of the studies on engagement have focused on the analysis of inter-subject variations, considering this variable as a lasting trait (Bakker et al., 2015). This approach allows inter-subject comparisons, but it does not explain intra-subject fluctuations of engagement. However, recent diary studies support that engagement can also be understood as a momentary and transitory state presenting intra-subject variations in short periods of time (Bakker & Bal, 2010; Bakker, Demerouti, & Sanz-Vergel, 2014; Bakker et al., 2015; Sonnentag, Dormann, & Demerouti, 2010).

This study proposes the analysis of the daily intra-subject processes of academic engagement. In particular, it explores the mediator role of the perceived level of academic support received by students during the day in the relationship between the levels of self-efficacy and curiosity, measured early in the day, and the level of academic engagement measured at the end of the day. Thus, this study contributes to the identification of individual fluctuations in variables of positive functioning (engagement), in short periods of time, and to the determination of the mediating role of environmental resources (academic support) in the relationship of personal resources (self-efficacy and curiosity) with these variables.

### **1.1. The job demands-resources model (JD-R)**

This research used as a theoretical framework the Job-Demands-Resources model and, specifically, focused on its motivational process (Bakker & Demerouti, 2007). According to this process, organizational resources generate well-being and motivation in individuals because they help them to satisfy their needs. Resources are physical, psychological, social, or organizational aspects that favor the achievement of goals, reduce the demands and the physiological and psychological costs associated with them,

and stimulate the individual's growth, learning, and development (e.g., social support, feedback) (Bakker & Demerouti, 2007, 2014). From this perspective, resources like social support may favor engagement and academic performance (Hakanen & Roodt, 2010), performing an intrinsic and extrinsic motivational role (Schaufeli & Taris, 2014).

The JD-R model has already been used in the academic context with high school students (Salmela-Aro & Upadyaya, 2014) and college students (Boyd et al., 2011). For example, one study found positive correlations between the perception of student activity facilitators and psychological well-being: engagement, satisfaction with the studies, and commitment to the university (Salanova, Martínez, Bresó, Llorens, & Grau, 2005).

The expansion of the JD-R model led to the incorporation of personal resources in this approach (Schaufeli & Taris, 2014). Personal resources are aspects of the self representing individuals' ability to control and successfully affect their environment (Hobfoll, Johnson, Ennis, & Jackson, 2003). Personal resources may influence the way people perceive, change, and react to the environment (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009a). Personal resources are important predictors of motivation and can mobilize job/academic resources and promote more engagement, which, in turn, can increase future job and personal resources (Bakker & Demerouti, 2014; Salanova & Schaufeli, 2009). For example, personal resources like self-efficacy and curiosity can favor the achievement of goals, personal growth, and individual development, fulfilling an important motivational role (Schaufeli & Taris, 2014).

Self-efficacy is one of the personal resources commonly addressed by the JD-R model (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). It is a set of beliefs that affect individuals' self-motivation about their own abilities to organize and carry out actions that will lead to specific results (Bandura, 1997, 2001). These beliefs can change as a function of the activities and situations (Salanova, Lorente, & Vera, 2009). Self-efficacy

influences the challenges chosen by individuals, their efforts and perseverance to achieve their goals, and how they deal with difficulties (Bandura, 2004).

One of the most important domains for the study of self-efficacy is the academic environment, due to the diversity of situations faced by students. Academic self-efficacy is understood as individuals' self-assessment of their abilities or possibilities to succeed in the academic setting (Robbins, Davis, Lauver, Langley & Carlstrom, 2004). Self-efficacy is associated with academic engagement because it stimulates individuals to use more energy and effort to perform the activities, which leads to increasing their state of involvement and absorption (Schaufeli & Salanova, 2007). Diary studies have shown the positive relationship of personal resources (e.g., self-efficacy, optimism) in the prediction of academic engagement in university students (Bakker et al., 2015). This relationship has also been noted in cross-sectional studies (Durán, Extremera, Rey, Fernández-Berrocal, & Montalbán, 2006; Ouwenel, Le Blanc, & Schaufeli, 2011; Salanova et al., 2005).

Curiosity is another resource associated with personal growth and intrinsic motivation. This resource represents the feeling of openness and receptivity to experiences that provide individuals with more than they already know (Kashdan, 2009), motivating them to explore the world and take on challenges (Kashdan & Silva, 2009). Curiosity is defined as a pleasurable motivational state characterized by the pursuit of novelty and information and challenging experiences (Kashdan, Steger, & Breen, 2007).

In the academic context, specifically in research with university students, curiosity has shown positive associations with engagement (Authors et al., 2017), satisfaction with life, meaningful existence and vitality (Brdar & Kashdan, 2010); positive affect, happiness and self-acceptance (Kashdan et al., 2009), personal growth (Kashdan, Rose, & Fincham, 2004); academic performance (Lounsbury, Fisher, Levy, & Welsh, 2009);

and well-being and meaning of life (Kashdan & Steger, 2007). On the other hand, curiosity has also shown negative associations with emotional exhaustion (Author et al., 2017), and depression and anxiety (Kashdan et al., 2009).

Curiosity influences academic engagement (Hulme, Green, & Ladd, 2013) and is considered one of the motivational skills of engaged workers who present a profile of vitality, energy, dedication, and absorption (Salanova & Schaufeli, 2009). Curious people respond more to situations that offer opportunities for personal growth, competence, and stimulation (Kashdan & Silva, 2009). Characteristics like intellectual curiosity and creativity, typical of individuals who are open to experience, have been associated with a need for variety and a more favorable attitude toward learning experiences (McCrae & Sutin, 2009).

Self-efficacy and curiosity favor individuals' intrinsic motivation, well-being, learning, and performance. Interventions based on personal resources, such as self-efficacy, have been proven to be efficient in promoting engagement in university students (Bresó, Schaufeli, & Salanova, 2011). The increase of personal resources like curiosity has been recommended in the university context to promote a stimulating educational environment that provides new learning opportunities and promotes personal development (Authors et al., 2017).

Based on the previous aspects of self-efficacy and curiosity, the initial hypotheses are:

*H1*: Daily levels of self-efficacy (*H1a*) and curiosity (*H1b*) early in the day are positively related to the daily level of academic engagement at the end of the day.

## **1.2. Academic support and academic engagement**

Job/ academic resources have an intrinsic and extrinsic motivating potential. Intrinsic motivators facilitate learning and personal development. Extrinsic motivators favor instrumental support or specific information to achieve one's goals (Schaufeli & Bakker,

2004). Resources have effects on individuals' health, motivation, and well-being and are predictors of psychological well-being (Bakker & Demerouti, 2014; Bresó & Salanova, 2009).

From an ecological perspective (considering the student in interaction with the learning environment), intrinsic motivation can be affected by external factors. For example, enthusiasm for learning may be impacted by environments that offer certain learning conditions such as quality of content, quality of instruction, teacher interest, and the supporting of student autonomy (Opdenakker & Minnaert, 2011). Similarly, an academic environment that offers ample resources can also contribute to student engagement (Bakker et al., 2015; Salanova, Schaufeli, Martínez et al, 2010; Salmela-Aro et al, 2016).

In the university context, social support for learning provided by professors and students has been identified as a facilitator of psychological well-being and academic performance (Salanova et al., 2005; Salanova, Schaufeli, Martínez et al., 2010). Taking into account these aspects, the second hypothesis is:

*H2: The daily levels of the perceived academic support received during the day are positively related to the daily levels of academic engagement at the end of the day.*

### **1.3. Job/academic resources as mediators**

Traditionally, personal resources have been considered mediators in the relationship between environmental factors and organizational outcomes (Xanthopoulou et al., 2007). However, there is evidence pointing to the opposite relationship: personal resources as antecedents and environmental resources as mediators of these outcomes (Schaufeli, 2017). The mediation of job resources in relation to personal resources for engagement has been verified in various studies. For example, researchers have found partial



mediation of job resources in a study of Dutch workers (Xanthopoulou et al., 2007), in a longitudinal investigation of secondary school teachers (Vera, Salanova, & Lorente, 2012), in a study with construction workers (Lorente, Salanova, Martínez, & Vera, 2014), and in studies done with public and private sector workers (Kotze, 2018).

Reciprocal relations between personal and job resources have also been verified in longitudinal research (Reis, Hope, & Schröder, 2015; Simbula, Guglielmi, & Schaufeli, 2011; Vera et al., 2012; Xanthopoulou et al., 2009a).

According to the conservation of resources (COR) theory (Hobfoll, 2001), reciprocity exists because learning experiences strengthen personal resources, which in turn favour identification and creation of even more resources in the work environment. Personal resources also are a predictor of future job resources (Salanova & Schaufeli, 2009; Xanthopoulou et al., 2009a). Personal and job resources therefore lead to further future engagement. Resources, both job and personal have a positive impact on engagement, which in turn reinforces these two types of resources (Salanova, Schaufeli, Xanthopoulou & Bakker, 2010).

According to the perspective of reciprocity between personal and job (or academic) resources, self-efficacious individuals focus more on environmental resources than on demands, developing low levels of exhaustion and high levels of engagement (Xanthopoulou et al., 2007). People who are considered effective focus on resources that can help them succeed (Lorente et al., 2014), directing their efforts to meet demands correctly (Vera et al., 2012).

Self-efficacy influences the way individuals perceive their environment, in particular, the social context. A more favorable perception of the environment can mediate in the relationship between self-efficacy and engagement, as confirmed in a longitudinal study

conducted with employees of a media company (Consiglio, Borgogni, Di Tecco, & Schaufeli, 2016).

Regarding curiosity, the scientific literature relates this feature of the individual with environmental factors (e.g., perception of support, presence of challenges). More desirable academic results are the product of good fit between students' interests and expectations and the characteristics of their educational context (Ketonen et al., 2016).

Environments that do not provide support or that do not challenge curious individuals can impair their motivation and performance. A study of adolescent students verified that the link between curiosity and academic performance was influenced by the perception of the school environment (Kashdan & Yuen, 2007).

Curiosity is an important motivator of behavior that encourages actions to reduce uncertainty, determine the novelties of the environment, and control the environment (Arnone, Small, Chauncey, & McKenna, 2011). Curiosity has two main facets that reflect its intrinsic motivating nature: a sense of interest and a sense of deprivation. In the first facet, curiosity is stimulated by the desire to find information for one's own benefit. In the second facet, curiosity is fueled by the desire to reduce the uncertainty and frustration caused by the lack of knowledge (Litman, 2008; Silva, 2012). Characteristics of curious individuals, such as the motivation to seek information, the desire to reduce uncertainty, and interest in controlling the environment, can promote the perception of environmental resources (job/academic) that enable one to achieve positive results (engagement). Curious people are more sensitive to environments that favor novelty, intellectual challenge, and potential growth (Kashdan & Yuen, 2007).

The relation between personal characteristics and environmental factors can promote desirable outcomes, such as engagement, or outcomes that may compromise well-being, such as emotional exhaustion. Considering this evidence, the mediation hypothesis is:

*H3*: The positive relationship between the daily level of self-efficacy and curiosity early in the day and the daily level of academic engagement at the end of the day will be mediated by the daily level of the perceived academic support received during the day.

#### **1.4. The present study**

This study examines whether self-efficacy and curiosity early in the day predict daily levels of academic engagement at the end of the day through of the perceived academic support received during the day. The choice of these time points to measure these variables is due to theoretical and methodological reasons. First, the way students begin their college days frames the way they experience and give rise to certain experiences in college (Rothbard & Wilk, 2011). In this way, the states of self-efficacy and curiosity that students perceive and experience in the morning, before entering university, can influence how students approach their academic environment (Ott, Haun, & Binnewies, 2019). In the case of this study, these states of self-efficacy and curiosity in the morning can contribute to obtaining greater support during university hours (measured at the end of their academic day, with the aim of covering the entire academic day). Finally, participants completed the engagement measure in the evening when they arrived home. In this sense, the design separated the measurement of the predictors and the criterion variables in order to avoid problems of common variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

The design used in this study (i.e., a diary study), with repeated measures nested within individuals, allows us to identify intra- and inter-subject variations. In diary studies, participants complete a series of short questionnaires on repeated occasions (e.g., over 5 days), or on several occasions within one day (e.g., morning, afternoon, and evening). In addition, this type of design allows us to aggregate all the repeated measurements of each

of the participants, computing the mean value of all the individual parameters and thus allowing a multilevel analysis of the relationships explored (Bryk & Raudenbusk, 1987; Schmitz, 2006). This type of design allows for the assessment and analysis of the short-term dynamics between perceptions, thoughts, feelings, and behaviors in people's natural environment (Ohly, Sonnentag, Niesen, & Zapf, 2010). The units of analysis are therefore the psychological states of individuals in specific contexts (as opposed to cross-sectional studies where the unit of analysis is people and individual differences between subjects are analyzed).

The introduction of this intra-individual approach and diary design in the field of learning and education allows us to go deeper into students' psychological processes (i.e. the sequence of their psychological states) and to identify antecedents and consequences of the central phenomena we are exploring, taking into account their temporal dimension (Schmitz & Wiese, 2006). It is important to note that when we approach the study of students' psychological processes, as is the case with this study, the emphasis has to be on states rather than traits. In this sense, diary studies are one of the most appropriate methodologies to assess those states and their relationships over time, and in the students' natural contexts (Schmitz & Wiese, 2006).

The criterion variable of this study is academic engagement as a state. Sonnentag (2003) was the first author to propose that the engagement variable should not only be a persistent and generalized cognitive-affective state, that is, a trait. This author showed and argued that engagement levels could vary within the same individual from one day to the next, in response to personal situations and conditions (or other psychological states). Thus, she differentiated between engagement as a trait (referring to how the person feels in general in relation to his or her job/studies over long periods of time); and daily engagement (engagement state), which reflects a transitory state of mind that exists

at a given time and fluctuates within the same person over different periods of time (e.g., throughout the day or week). Moreover, the same analogy can be transferred to the rest of the variables present in this study. Different studies have shown that people also experience and reflect daily states of curiosity (Kashdan & Steger, 2007), daily states of self-efficacy (Xanthopoulou et al., 2009a) and perceived support (Xanthopoulou, Bakker, Heuven, Demerouti, & Schaufeli, 2008), in addition to showing daily associations between them.

In conclusion, students can have an overview of their personal and academic resources (e.g., general self-efficacy, general curiosity and general academic support), which may vary among different individuals (between variations). But they may also be more or less self-efficacy and curious, perceive more or less support or experience more or less engagement on different days, experiencing fluctuations from one day to the next based on the presence of other states or conditions (intra-individual variations). The study contributes to research in different ways: a) investigating personal resources as antecedents of environmental resources, considering that many studies address the opposite relationship by examining phenomena like engagement (Reis et al., 2015); b) addressing academic engagement as transient state that can vary daily, as the majority of the studies investigate these phenomena as stable and long-lasting conditions (Bakker et al., 2015; Beal, Weiss, Barros, & McDermid, 2005); c) conducting the study in the academic context, with a pre-occupational sample, as the greater part of investigations of this issue are carried out with workers in organizations; and d) investigating curiosity as a personal resource and exploring its relationship with academic engagement.

## **2. Method**

### **2.1. Participants and procedure**

The research was conducted with a sample of students of the Psychology course of a public university, located in the Autonomous Community of Madrid, Spain. One-hundred and twenty students enrolled to participate in the study. One hundred and five completed the General Questionnaire and received the Daily Questionnaire. Of these students, 100 returned the Daily Questionnaire (over 94% return rate). Six questionnaires were excluded for missing data in 3 or more periods of the week (for example, the morning of Day 1, the afternoon of Day 3, and the morning of Day 5). Participants answered the Daily Questionnaire 3 times a day for 5 days ( $M = 14.80$ ,  $SD = 0.49$ , min. = 13 - max. = 15). The final sample was made up of 94 participants, with a mean age of 20.21 years ( $SD = 4.94$ ). The predominant characteristics of the sample were: female (86.2%) and absence of employment relationship (76.2%).

The evaluation of the variables of the study was done by a research protocol that included a General Questionnaire and a Daily Questionnaire. The same measurement instruments were used to assess the general level and the daily level. At the general level, the participants completed the following scales: self-efficacy, curiosity, academic support, academic engagement. We also requested demographic (i.e., age, gender) and academic information (i.e., course, employment relationship). The evaluation on the general level allowed us to establish baseline values (*trait*) of each participant in the study variables. The General Questionnaire was completed one week before beginning to fill in the Daily Questionnaire. The Daily Questionnaire was completed three times a day (in the morning, in the afternoon, and at night) for five consecutive university-class days from Monday to Friday.

To avoid problems associated with the common variance method, temporal separation within the same day for the measurement of the predictors and the criterion variables was used (Ohly et al., 2010; Sonnentag et al., 2010). The predictors self-efficacy and curiosity

were measured in the morning, before going to the university. The mediator perceived academic support was evaluated in the afternoon, when leaving the university. The criterion variable (academic engagement) was measured at night, before going to bed (Figure 1).

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Insert figure 1 about here

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With regard to the data collection procedure, the students were contacted through the dissemination of the research in the faculty. Participants registered for the application of the General Questionnaire through an electronic link, using a pseudonym.

The participants completed the General Questionnaire (paper and pencil) after receiving the relevant information about the study. After returning the General Questionnaire, the participants received the Daily Questionnaire with an envelope for its subsequent return. According to the Ethical Guidelines of the General Council of Psychology of Spain (CGPE) and the Code of Good Ethical Practice of the university where this study was carried out, the express informed consent of all participants was obtained in this research. In addition, all data were anonymized to guarantee the absolute confidentiality of the participants. They also accepted to participate in the research freely and were able to leave the study at any time they wished. The research protocol had the favorable report of the university's ethics committee (hidden reference in order to guarantee the anonymity of this manuscript).

The research team sent some emails during the week to remind participants to fill in the instrument. Participants were also urged to use their mobile alarm to remember to fill in the Daily Questionnaire at different times of the day. Although there was no instruction on the exact time of completion of the questionnaire (beyond telling the students to complete it before entering the university, when leaving it and in the evening when they were at home) because this could vary depending on the specific subjects and schedules

of each student, we did collect the time at which the questionnaires were completed and the following descriptions were obtained: in the morning ( $M = 8\text{h } 30\text{ a.m.}; SD = 1.59$ ); in the afternoon ( $M = 15:50\text{h p.m.}; SD = 2.24$ ) and at night at home ( $M = 21\text{h p.m.}; SD = 6.33$ ). The Daily Questionnaire was returned in a sealed envelope, the following week, at the previously agreed place and time.

## 2.2. Instruments

The same scales of the General Questionnaire were used to evaluate the daily level. The wording of the items of the Daily Questionnaire was adapted to the temporal moment in which the scales would be completed (morning, afternoon, and night), in accordance with the method used in diary studies (Nezlek, 2012). The Daily Questionnaire was in booklet format. The same response scale was used for all the measures at the daily level ( $1 = \text{completely disagree}$ ,  $7 = \text{completely agree}$ ).

The Self-efficacy and Curiosity scales, which had more items in the General Questionnaire, were reduced for the Daily Questionnaire. This procedure is recommended in diary methodology (Nezlek, 2012). To select the items used in the Daily Questionnaire, the criterion of factor loading and face validity were adopted, following the procedure used in some diary studies (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2012; Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009b).

*2.2.1 Academic self-efficacy:* this variable was evaluated using the perceived General Self-efficacy Scale (Baessler & Schwarzer, 1996). The items of this instrument were adapted to evaluate self-efficacy in the academic context (e.g., “I am confident that I could effectively cope with unexpected problems in my studies”). Items were rated on a Likert-type scale, ranging from 1 (*completely disagree*) to 7 (*completely agree*). The scale presented a Cronbach alpha of .82. For the Daily Questionnaire, 6 items from the 10 items that make up the full scale were selected (e.g., “At this point, I feel that I can overcome



unforeseen situations in my studies today, thanks to my qualities and resources”). The Cronbach alpha for the 5 days of the study ranged from .92 to .95 ( $M = 0.95$ ).

2.2.2 *Curiosity* was measured by means of the Curiosity and Exploration Inventory II (Kashdan et al., 2009). This instrument presents the factors *Exploration* and *Absorption*. The scale contains 10 items (e.g., “I consider situations that pose a challenge as an opportunity to grow and learn,” “I seek new experiences wherever I go”). The Cronbach alpha of the scale was .78. Items were rated on a Likert-type scale, ranging from 1 (*Completely Disagree*) to 7 (*Completely Agree*). For the daily measurement, 6 items (3 of each factor) from the 10 that make up the full scale were chosen (e.g., “At this point, today, I think that I will seek new experiences wherever I go”). The Cronbach alpha of the 5 days ranged from .88 to .91 ( $M = 0.89$ ).

2.2.3 *Academic support*: 8 items were designed to assess this construct. The scale presented a Cronbach alpha of .72. An example item of this measure is: “In my course, the students support each other to resolve difficulties in their studies.” To evaluate academic support at the general level, we used a Likert-type agreement scale, ranging from 1 (*Completely Disagree*) to 7 (*Completely Agree*). The scale items were adapted for the daily measurement (e.g., “Today at the university, I perceived that the professors stimulate the participation of the students in the classes”). The Cronbach alpha over the 5 days ranged from .76 to .80 ( $M = 0.78$ ).

2.2.4 *Academic Engagement*: this variable was evaluated with the reduced version of the *Utrecht Work Engagement Scale – UWES* - version for students (Schaufeli, Bakker, & Salanova, 2006). The reduced version of this measure is made up of 9 items that measure the factors *Vigor* (e.g., “My activities as a student make me feel full of energy”), *Dedication* (e.g., “My studies inspire new things for me”), and *Absorption* (e.g., “I 'let myself go' when I perform my activities as a student”). The Cronbach alpha of the scale

as a single factor was .88. Items were rated on a Likert-type scale, ranging from 1 (*Completely Disagree*) to 7 (*Completely Agree*). Academic engagement was measured as a global score, considering that this is one of the alternatives recommended for the use of the UWES (Schaufeli et al., 2006). The items were adapted for the Daily Questionnaire (e.g., “Today, I have felt full of energy in my activities as a student”). The Cronbach alpha of engagement as a single factor varied over the 5 days between .86 and .90 ( $M = 0.88$ ).

### **2.3 Analysis strategy**

The research design, with repeated measures nested within individuals, was tested with multilevel techniques (Hox, 2010). The model has two levels: repeated measures at the day-level (Level 1: within-person;  $N = 470$  diary entries), and the participants at Level 2 (between-persons;  $N = 94$ ).

The baseline measurement of the dependent variable (academic engagement), obtained with the General Questionnaire, was used as a control variable. The pairing of the questionnaires (General and Daily) was performed using a personal code created by the student.

To set the reference value used in the relationship between the predictor (self-efficacy and curiosity) and the dependent variable the following methods were used: *person-mean centering* and *grand-mean centering*. The *person-mean centering* method, which considers the mean scores of each participant, was adopted for the variables of Level 1.

The *grand-mean centering* method, which considers the mean scores of all the participants, was used for the variables of Level 2. This procedure allows all the variance between subjects to be eliminated so that it does not influence the interpretation of the results (Nezlek, 2012; Ohly et al., 2010).

For the multilevel analyses all the requirements for mediation were verified in accordance with Baron and Kenny (1986): a) there must be a relationship between the

predictor and the mediator; b) the mediator and the criterion variable must be related; c) after entering the mediator, the relationship between the predictor and the criterion variable will cease to be significant (complete mediation) or will be weaker (partial mediation). The significance of the effect of the mediation was evaluated by the Sobel test. The data were analyzed with the MLwiN program, version 2.28. As a measure of effect size, was computed pseudo- $R^2$ , following the recommendations of Singer and Willet (2003, pp. 102-104). The pseudo- $R^2$  statistic is used to quantify the incremental variance in the dependent variable that is predicted by adding a new set of predictors to a given model.

Additionally, structural validity for each measure was assessed using multilevel confirmatory factor analyses (MCFA) with the variables evaluated at the daily level. MCFA allows the estimation of the factor structure at both analysis level: within-person and between-person. MPlus software (Muthén & Muthén, 2010) was employed to compute these models. Model fit was assessed using RMSEA and CFI indices; values close to .95 for CFI and below .06 for RMSEA suggest a good fit (Hu & Bentler, 1999). Modification indices (MIs) were used sequentially to allow covariations between items in within-person and between-person levels.

### 3. Results

Table 1 shows the means, standard deviations, Cronbach alphas, and Pearson correlations between the person-level variables.

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Table 2 shows the means, standard deviations, Cronbach alphas, and Pearson correlations between the day-level variables. The reliability of the daily scales was calculated by averaging the value of the Cronbach alpha of the 5 days of the study.

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Insert table 2 about here

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### 3.1. Preliminary analyses

The intraclass correlation coefficient was calculated to determine the percentage of variance corresponding to each of the levels of analysis (Hox, 2010). In accordance with the results, 65.5% [ $0.708 / (.708 + 0.372) = 0.655$ ] of the variance of the criterion variable engagement academic (at the end of the day) can be explained by the inter-subject differences, and 34.5% by the intra-subject differences. The predictors presented the following percentages of inter-subject variation: 40.77% Self-efficacy (early in the day) and 49.40% Curiosity (early in the day). The inter-subject variation of the mediator perceived academic support (during the day) was 57.33%. Based on the findings, a significant proportion of the variance of the criterion variables can be explained by intra-subject variations throughout the 5 days of the study, which justifies the use of multilevel analysis.

Preliminary analyses were performed to verify that the conditions required for mediation were met (Baron & Kenny, 1986). This analysis showed a positive relationship of Self-efficacy with Academic engagement ( $t = 5.64, p < .001$ ) and Perceived academic support ( $t = 2.68, p < .01$ ). Curiosity was significantly related to both Academic engagement ( $t = 5.55, p < .001$ ) and Perceived academic support ( $t = 2.53, p < .05$ ). Perceived academic support was significantly related to Academic engagement ( $t = 4.58, p < .001$ ).

### 3.2. Structural validity

Multilevel Confirmatory Factor Analysis (MCFA) were computed for each variable measured at the diary level. Table 3 depicts the fit indices, the standardized weights, and the correlations between indices allowed after the inspection of the modification indices (MIs).

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Insert table 3 about here

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The model fit was adequate for all measures. Specifically, for the self-efficacy factor, the fit indices were excellent (RMSEA = 0.047, CFI = 0.990) after allowing the correlation between item 1 (“I feel confident that today I will be able to effectively handle unexpected problems in my studies”) and item 2 (“I feel that thanks to my qualities and resources, today I will be able to overcome unforeseen situations in my studies.”) at within-level ( $r = .393$ ;  $p < .001$ ). Similar fit indices were found for the curiosity factor (RMSEA = 0.052, CFI = 0.984). The final model for the curiosity factor allowed the correlation between item 1 (“I think I’ll do my best today when I do something complex or challenging”) and item 2 (“I believe that today I will seek new experiences wherever I go”) at within-level ( $r = .613$ ;  $p < .001$ ). The model fit for the academic support factor was reasonable after allowing covariations between items 3 (“Today, I realized that in my course the teachers are concerned with the academic performance of the students”) and item 5 (“Today, I realized that the students in my course are collaborating with each other to carry out the activities.”). Also, between item 5 and item 8 (“Today, I noticed that the teachers of my course encourage the participation of the students in the classes”), and between item 3 and item 8, at both analysis level: within-person and between-person (RMSEA = 0.050, CFI = 0.929). Specific correlation values are depicted at Table 3. Items with standardized weights lower than .10 were non-significant, and therefore, the structure of this factor should be improved in future research. Finally, for the academic engagement factor, the fit indices were acceptable (RMSEA = 0.059, CFI = 0.911) after allowing the correlation between item 5 (“When I woke up in the morning I felt like going to class or studying”) and item 9 (“Today, I got "carried away" when I was studying”) at between-person level ( $r = .874$ ;  $p < .001$ ).

### **3.3. Analysis of the hypotheses**

In accordance with the data analysis technique, the variables were introduced by models for the criterion variable: state of academic engagement (at the end of the day). The null model presents the constant. Model 1 introduces the control variable (general level of the criterion variable). Model 2 adds the predictor. Finally, Model 3 includes the mediating variable. The fit of the model was evaluated by the significant value of the difference of  $-2 * \log$  coefficient. After confirming the mediation, the Sobel test was performed to assess the significance of the effect.

The first hypothesis states that daily levels of self-efficacy (*H1a*) and curiosity (*H1b*) early in the day are positively related to the daily level of academic engagement at the end of the day. The daily level of self-efficacy was positively related to academic engagement ( $t = 5.64, p < .001$ ). The daily level of curiosity also showed a positive relationship with academic engagement ( $t = 5.55, p < .001$ ). Therefore, Hypothesis 1a and 1b were confirmed.

The second hypothesis says that daily levels of the perceived academic support during the day are positively related to the daily levels of academic engagement at the end of the day. The mediator perceived academic support was positively related to academic engagement ( $t = 4.58, p < .001$ ). The model including academic support presented a significant improvement over the model with the intercept (difference of  $-2 * \log = 36.28, df = 1, p < .001$ ). Hypothesis *H2* was therefore confirmed.

Finally, the third hypothesis declares that the positive relationship between the daily level of self-efficacy and curiosity early in the day and the daily level of academic engagement at the end of the day will be mediated by the daily level of the perceived academic support during the day. Model 2 (Table 4 ) showed that self-efficacy was positively related to academic engagement ( $\beta = 0.209, SE = 0.037, t = 5.64, p < .001$ ). Results showed a better fit of the model to the data (difference of  $-2 * \log = 30.23, df = 1, p < .0001$ ) when including

the mediator academic support in Model 3 ( $\beta = 0.224$ ,  $SE = 0.057$ ,  $t = 3.92$ ,  $p < 0.001$ ). The inclusion of this mediator in Model 3 was accompanied by a reduction in the value of the predictor self-efficacy (decreasing from  $t = 5.64$  to  $t = 4.92$ ,  $p < .001$ ,  $\beta = 0.187$ ,  $SE = 0.038$ ), suggesting a partial mediation of academic support in the relation of self-efficacy with the state of academic engagement. The application of the Sobel test corroborated the significance of the mediator effect ( $z = 2.31$ ,  $p = .02$ ). With regard to pseudo- $R^2$ , all the predictor and control variables entered in the models explained 50.42 % of the variance at Level 2 [ $(0.708 - 0.351) / 0.708 = 0.5042$ ] and 9.95 % of the variance at the Level 1 [ $(0.372 - 0.335) / 0.372 = 0.0995$ ].

Model 2 (Table 4 ) shows that curiosity was positively related to the criterion variable academic engagement ( $\beta = 0.189$ ,  $SE = 0.034$ ,  $t = 5.55$ ,  $p < .001$ ). The inclusion of the mediator academic support in Model 3 ( $\beta = 0.226$ ,  $SE = 0.057$ ,  $t = 3.96$ ,  $p < 0.001$ ) showed a decrease in the value of the predictor curiosity (going from  $t = 5.55$  to  $t = 5.0$ ,  $p < .001$ ,  $\beta = 0.170$ ,  $SE = 0.034$ ), suggesting a partial mediation of perceived academic support in the relationship of curiosity with academic engagement. Model 3 showed a better fit to the data (difference of  $-2 \cdot \log = 29.87$ ,  $df = 1$ ,  $p < .0001$ ) in comparison with the other models. The mediator effect was corroborated by the Sobel test ( $z = 2.21$ ,  $p = .02$ ). Hypothesis 3 was thus confirmed. With regard to pseudo- $R^2$ , all the predictor and control variables entered in the models explained 50.28 % of the variance at Level 2 [ $(0.708 - 0.352) / 0.708 = 0.5042$ ] and 9.95 % of the variance at the Level 1 [ $(0.372 - 0.335) / 0.372 = 0.0995$ ].

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Insert table 4 about here

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### 3.4. Additional analysis

We also decided to carry out random effects models on the data aim to investigate if there were individual difference in the mediation effects (Hamaker & Wichers, 2017). R

software (nlme library) was employed to compute: fixed-effects models, random-effects models and the comparison between both types of models. The comparison was done for the models 2 (inclusion of Day-level self-efficacy or Day-level self-curiosity) and for the model 3 (Day-level self-efficacy or Day-level self-curiosity + Day-level academic support). The comparison between fixed-effects and random-effects model was not significant. Therefore, only the fixed-effects models are included in the manuscript.

#### **4. Discussion**

The objective of this study was to explore the mediator role of perceived academic support during the day in the relationship of self-efficacy and curiosity early in the day with academic engagement at the end of the day. The set of results reaffirmed the importance of academic resources in the relationship of personal resources with daily levels of engagement. Specifically, the results of the multilevel analysis confirmed the partial mediation of perceived academic support in the relationship of self-efficacy and curiosity with academic engagement.

The investigation confirmed the positive relationship of self-efficacy and curiosity with academic engagement, as found in other diary studies (Bakker et al., 2015; Author et al., 2017). These results reaffirm the intrinsic motivating role of self-efficacy (Bandura, 2001, 2004) and curiosity (Kashdan et al., 2007) for the achievement of positive results.

This diary study also confirmed the positive relationship of perceived academic support with engagement. This outcome is in line with different investigations showing that job/academic resources favor engagement and well-being. This relationship has been confirmed in cross-sectional studies (Salanova et al., 2005; Salanova, Schaufeli, Martínez et al., 2010) and also in studies examining daily or weekly fluctuations (Bakker & Bal., 2010; Bakker, et al., 2015; Xanthopoulou et al., 2008).



The partial mediation of job/academic resources in the relationship of personal resources with positive results, verified in the present study, has already been found in other investigations (Xanthopoulou et al., 2007). In the academic area, studies with students have shown that they will probably show greater engagement when professors and classmates create a supportive environment (Wang & Eccles, 2012). Research with workers has also confirmed the importance of support for the scope of engagement and for the prevention of burnout (Salanova & Schaufeli, 2009). Social factors, including support, partially mediated the relationship between self-efficacy and engagement in a sample of workers from a media company (Consoglio et al., 2016).

The results of this study allow us to observe that engagement at the daily level depends on self-efficacy, but this relationship is also partially mediated by academic support. Thus, self-efficacy early in the day increases the perception of academic support during the day, which, in turn, has led to greater engagement at the end of the day. In this way, engagement may vary in the same individual from day to day, as a response to specific situations (Bakker, 2014; Sonnentag et al., 2010).

Preliminary analysis, carried out to verify the requirements for mediation, showed the role of personal resources (i.e., self-efficacy, curiosity) in the morning as an antecedent of the resource of the perceived academic support in the afternoon. These results are in accordance with the motivational process proposed in the JDR model (Schaufeli & Taris, 2014). Thus, the perceived academic support during the day depends, to a great extent, on the students' personal attitudes early in the day at the level of self-efficacy and curiosity, showing how a more social level of support would be reached at an individual level, which promotes better results in daily academic engagement.

The findings suggest that individuals with personal resources of self-efficacy can identify or create social aspects that facilitate achieving their goals and promote

engagement (Xanthopoulou et al., 2007). For example, self-efficacy can affect the way individuals perceive their environment. Self-efficacious people perceive their social environment in a more positive way over time (Consiglio et al., 2016). This influence can be explained by the “cultivation hypothesis” in which self-efficacy can act as an *establisher* of social support (Schwarzer & Knoll, 2007).

This study also identified the partial mediation of academic support in the relationship of curiosity with engagement. Individuals' personal resources and belief in their ability to control the environment increase the likelihood of perceiving job resources as abundant, which in turn favors engagement (Lorente et al., 2014) and highlights the daily influence of these variables.

The perception of academic support by curious individuals may be related to characteristics of curiosity (search for information, reduction of uncertainty, and interest in controlling the environment), which encourage a more attentive exploration of environmental resources that help to achieve one's goals. Curious individuals are more attentive, they process information at a deeper level and retain it better, and they persist in tasks to achieve their goals (Kashdan & Yuen, 2007). These effects have general and daily consequences.

Students with intellectual curiosity and openness take better advantage of the available resources in their academic environment (Bakker et al., 2015). Curious students thrive in schools that acknowledge and stimulate the search for new information and for experiences that pose challenges. Academically desirable outcomes have been observed in academic environments that curious individuals perceived as stimulating (Kashdan & Yuen, 2007). Curious people are more active in situations that offer opportunities for growth, competence, and stimulation (Kashdan & Silvia, 2009). These people tend to see the world in ways that evoke feelings of interest (Silvia & Kashdan, 2009). The intrinsic

motivational nature of curiosity, which comprises exploration of the environment and focusing on activities that facilitate learning, competence, and self-determination, can promote high levels of engagement (Author et al., 2017). Individuals with high levels of curiosity have more positive emotions (Wang & Li, 2015), as was confirmed in the present study by the high and positive correlations between curiosity and engagement, both at the general level and at the daily level. Thus, the results of this study indicate that students' curiosity in the morning increases their perception of academic support in the afternoon, which, in turn, leads to greater engagement and better self-reported performance at the end of the day.

The impact of curiosity on engagement, partially mediated by academic support, can be explained by the intrinsic motivating potential of curiosity, which fosters learning and personal development and by its extrinsic potential, which promotes instrumental and informational support to achieve goals (Schaufeli & Bakker, 2004; Xanthopoulou et al., 2009a).

The results obtained in this study support the thesis that personal resources influence behavior through goals and aspirations, expectations of results, affective states, and perceived opportunities and barriers in the social environment (Lorente et al., 2014). These resources serve as a “third variable” that affects both the perception of job/academic characteristics and the well-being of the individual. This third variable could also explain the relationship between these two aspects (Schaufeli & Taris, 2014).

#### **4.1. Limitations and future research**

One limitation of the study is related to the use of self-report measures, which can lead to problems associated with the common variance method. To cope with this difficulty, the predictors and criterion variables were measured at different times during the day

(Mehl & Conner, 2012; Ohly et al., 2010). In addition, the personal scores were centered in the analyses.

Another limitation of the study is that most of the participants of the sample were women, which may limit the generalizability of the results to males. However, gender studies emphasize the importance of investigating psychosocial processes in women, with the aim of providing specific knowledge for this group (Ryan & Branscombe, 2013). Future research will be able to investigate any differences in the mediation effect related to the day. A developing body of research is applying mediation analysis to elucidate mechanistic pathways between variables related to daily indicators and academic engagement. Now scarce evidence would be clarified by more intensively collected longitudinal data and improvements in analysis.

#### **4.2. Practical implications and conclusion**

Universities can create mechanisms that reinforce the academic support offered by professors and students. They can also implement psychological support programs or instructional programs aimed at strengthening the effectiveness of student resources. Training situations are suitable to enhance self-efficacy, which, in turn, will reinforce academic engagement (Carmona-Halty, Salanova, Llorens, & Schaufeli, 2018; Salanova & Schaufeli, 2009). For example, cognitive-behavioral interventions (Bresó et al., 2011) and activities that offer positive feedback about performance (Carmona-Halty et al., 2018; Ouwenel, Schaufeli, & Le Blanc, 2013) have been adopted to increase levels of self-efficacy, engagement, and academic performance.

From the perspective of the Social Cognitive Theory, self-efficacy can be promoted from different sources, such as: experiences of dominance, social persuasion, vicarious experience, and emotional states (Consiglio et al., 2016; Salanova & Schaufeli, 2009).

With regard to curiosity, the academic context should favor a learning environment based on research, innovation, and openness to experience, offering opportunities for learning and personal development (Author et al., 2017). The use of strategies can increase the likelihood that curious explorations will serve as a basis for long-lasting interests that are partially built by the personal meaning and the value attributed by the individual to a particular activity (Kashdan, 2009).

Personal resources with intrinsic motivational connotation, such as self-efficacy and curiosity, are important to achieve states of well-being. These resources also increase academic support, leading to greater engagement. From the perspective of the daily variability that characterized our study, academic resources played a role of mediator in the achievement of those states. This evidence suggests that organizational interventions in the academic context that promote self-efficacy, encourage curiosity, and strengthen academic support may promote the well-being and performance of the individual, as well as generate more meaning to the acquisition of knowledge and a stronger link with the career. Previous studies have already shown the importance of increasing the levels of personal and job resources to improve levels of engagement and performance (Lorente et al., 2014).

#### **4.3. Conclusions**

In conclusion, the present diary study investigated the mediating role of academic resources (perceived academic support) in the relationship between personal resources (self-efficacy and curiosity) with the academic engagement. The verified partial mediation reveals the need for educational organizations to provide an environment that promotes the development of these two types of resources (academic and personal) in order to foster students' learning and personal growth, favoring the achievement of their academic goals and their vocational training.

#### 4.4. Conflict of interest

The authors declare that they have no conflict of interest.

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