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Objective assessment of goal orientation, time management and learning outcomes

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Título: Evaluación objetiva de la orientación a metas, la gestión del tiempo y los resultados de aprendizaje.
Resumen: Las conductas dirigidas a lograr metas y a gestionar tareas en un periodo de tiempo determinado desempeñan un papel importante cuando las personas realizan actividades de aprendizaje. Estos comportamientos, denominados como orientación a metas y gestión del tiempo, han sido ampliamente estudiados desde los modelos de aprendizaje autorregulado. Estudios previos han empleado tradicionalmente auto-informes para estudiar estas variables. Sin embargo, esta metodología subjetiva presenta limitaciones, por lo que algunos autores han enfatizado las ventajas del empleo de medidas objetivas. En este trabajo, empleamos test objetivos para evaluar la orientación a metas, la gestión del tiempo y estudiar su relación con resultados de aprendizaje. Se emplea un modelo de ecuaciones estructurales para examinar las relaciones. Los resultados muestran un buen ajuste del modelo a los datos. La orientación al aprendizaje muestra un efecto directo sobre la gestión del tiempo y ambas variables muestran un efecto directo sobre una tarea de aprendizaje. La gestión del tiempo mostró un efecto directo sobre el rendimiento académico. Se discuten las implicaciones teóricas y prácticas.
Palabras clave: Test objetivo. Orientación a metas. Gestión del tiempo. Aprendizaje. Auto-regulación.

Abstract: Behaviors directed to achieving goals and managing tasks in a set period of time play important roles when people engage in learning activities. These behaviors, labeled goal orientation and time management, have been widely studied as part of self-regulated learning models. Previous works have traditionally employed self-reports to study these variables. However, these subjective methodologies suffer from limitations, and some researchers highlight the advantages of using objective measures. In the present work, we employ objective tests to study goal orientation, time management and their relation to learning outcomes. We propose a model and employ structural equation modeling to examine the hypothesized relations. The results provided a good fit to the data. Goal orientation (mastery) has a direct effect on time management, and both variables have direct effects on scores in a learning task. Time management also has a direct effect on academic performance. Theoretical and practical implications are discussed.
Keywords: Objective tests. Goal orientation. Time management. Learning. Self-regulation.

Introduction

Self-regulated learning involves variables that are relevant to achieving learning outcomes. The most frequently-cited self-regulated learning models are those developed by Zimmerman (2000, 2008) and Pintrich (2000; see Panadero, 2017). These authors describe that, when people have to complete tasks, they set goals, show goal-oriented behaviors, prepare for the action, execute behaviors to complete the tasks in a given time frame, and make adjustments based on their progress. Such models are based on Bandura's (1986) socio-cognitive model, which considers the interactions among the categories of person, behavior and environment. Self-regulated learning theories describe learners as proactive agents in the learning process, emphasizing that this process takes place in interaction with the context. Learners who self-regulate their behavior would be considered self-efficacious (Bandura, 1995; Zimmerman, 1996).

Self-regulated learning models contemplate several variables that represent proactive learning behaviors and, among them, Zimmerman (e.g., Zimmerman, 2000, 2008) and Pintrich (e.g., Pintrich 2000, Pintrich et al., 1993) identify that goal orientation and time management play important roles, as these variables determine to a large extent how people are able to achieve their goals. Few works have explored both goal orientation and time management, and those that have done so, have measured them through self-reports, which have known limitations. Several authors (e.g., Hong et al., 2020; Panadero, 2017; Torrano & González, 2004; Winne & Perry, 2000) have identified the need to continue the exploration of self-regulated learning variables from different approaches and methods. Furthermore, although most studies exploring self-regulation include a large number of variables, it has been suggested that a "narrow" perspective is also required (Panadero, 2017). In the present work, we aim to address these needs. From a behavioral approach, we focus on goal orientation (mastery-orientation) and time management and assess them through objective tests to study their relation and their effect on learning outcomes.

Goal orientation

When studying and modeling behaviors directed toward goal achievement, goal orientation theory has received the most attention in the literature. Independently, but in the same time period, authors such as Eison (1979), Nicholls (1984) and Dweck (1986) identified two main goal orientations: mastery and performance. Mastery-oriented people are those who want to learn in order to improve their competence. They tend to consider tasks as challenges and enjoy solving them. Performance-oriented people are those who want to achieve the highest scores possible. They tend to consider tasks as an opportunity to demonstrate their com-

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petence (Acarla & Bilgiç, 2010; Ames & Archer, 1988; Dweck, 1986; Morrone & Schutz, 2000; Payne et al., 2007; Senko & Dawson, 2017).

Goal orientation theory has also been linked to other theories of motivation. It has been extensively studied within the framework of self-determination theory (see Deci & Ryan, 1985) since this theory identifies the psychological needs of people to achieve competence. On the other hand, Atkinson's concept of achievement motivation (see Atkinson, 1964) has also influenced goal orientation theory. Based on Atkinson's work, authors such as Elliot and his colleagues (e.g., Elliot et al., 1999) incorporated approach and avoidance dimensions in the study of performance-orientation. The performance-approach dimension includes behaviors aimed at achieving benefits and demonstrating competence, whereas the performance-avoidance dimension includes behaviors aimed at avoiding failure or demonstrating incompetence. Later, the approach and avoidance dimensions were incorporated into mastery-orientation descriptions (Elliot, 2005). The mastery-approach dimension includes behaviors aimed at learning and acquiring competences, whereas the mastery-avoidance dimension includes behaviors aimed at preventing competence from being reduced. However, it has been argued that the avoidance dimension should perhaps be studied separately, conceptualizing it as a combination of fears and worries (see Miller, 2004; Roberts, 2007).

In the present work, we focus on the descriptions of goal orientation formulated by Eison (1979), Nicholls (1984) and Dweck (1986). We do not adopt Elliot's models but, in our work, we would apply the approach dimensions of goal orientation.

In Pintrich and Zimmerman's theories of self-regulation, great relevance is applied to the goal orientation variable. Pintrich (2000) devotes much of his work to explain the importance of goal orientation in his model of self-regulation. Both Zimmerman (2000, 2008) and Pintrich (2000) identify that learners who show a mastery-orientation are the ones that can obtain better learning outcomes, as they show interest in learning while performing tasks. Therefore, in this study, we will focus mainly on mastery-orientation.

Time management

Time management is considered to be a learning strategy (Zimmerman, 1996). It involves behaviors that people engage in when they need to perform tasks efficiently in a given period of time (Claessens et al., 2007; Koch & Kleinman, 2002). Compared to goal orientation, the time management variable has not been widely explored in the literature, neither theoretically nor empirically. The theoretical model that has gained the most ground in the literature and that has received empirical support is the behavioral decision-making theory applied to time management. This theory (Koch & Kleinman, 2002), describes that when people establish a goal, they need to consider the time available before pursuing it. In addition, they need to make decisions about the order in which tasks should be completed and when to start completing them. Then, they have to direct their behaviors in order to achieve their goals, while trying to limit the influence of distractors. In this work, we conceptualize time management according to behavioral decision-making theory.

From self-regulated learning models, it follows that learners who self-regulate their behaviors are those who manage their time better; they complete tasks more efficiently and make adjustments according to their progress, which allows them to obtain better learning results (Pintrich, 2000; Zimmerman, 2000, 2008). In our work, we will study objective measures of time management behaviors. We aim to contribute to the literature on self-regulated learning models, but, given that the previous work exploring time management is limited, we should also make contributions to the literature on time management.

Goal orientation, time management and learning outcomes

From self-regulated learning models, it is hypothesized that students who show a mastery-orientation should manage their time better and should be able to improve their competence. Time management behaviors should help mastery-oriented people to achieve learning goals (Pintrich, 2000; Zimmerman, 2000, 2008). Goal orientation theory describes mastery-oriented people as those who show adaptative learning strategies and try to improve their competences, which include managing time efficiently (Dweck, 1986; Payne et al., 2007).

From a theoretical point of view, it is assumed that goal orientation and time management are related. Empirical evidence also supports this assumption. Previous studies that employed self-reports have found that mastery-orientation was positively related to time management (Luo et al., 2011; Magno, 2012; Ranelluci et al., 2015; Won et al., 2018). Some authors (e.g., Elliot et al. 1999; Magno, 2012) have emphasized the need for more studies that explore the relation between time management and goal orientation. However, to date, such studies are limited.

Both Pintrich (2000) and Zimmerman (2000, 2008) focus on the importance of goal orientation and time management in their models precisely because of their potential to promote positive learning outcomes. Goal orientation plays an especially important role in academic fields. Mastery-oriented people are interested in learning and tend to achieve higher learning scores (Payne et al., 2007). When it comes to academic results, it is not clear if mastery-oriented people typically obtain higher grades. They show adaptative strategies but are more focused on learning than necessarily on examination results. On the other hand, despite performance-oriented people being interested in obtaining gains, they tend to show maladaptative strategies and therefore do not always obtain good academic results (Ng, 2017; Ranelluci et al., 2015). Some empirical studies have found a positive, signifi-

cant relation between mastery-orientation and academic achievement (e.g., Day et al., 2003; Patrick et al., 2007; Steinmayr et al., 2011, 2019). However, other studies found no significant relation (e.g., Elliot & Church, 1997; Ng, 2017; Ranelluci et al., 2015).

Learning strategies such as time management have also received special attention in an educational context (e.g., Ahmad-Uzir et al., 2019; Petersen et al., 2016; Thibodeaux et al., 2017). Students need to complete assignments on time during their education. Most courses set deadlines that have to be met in order to get a passing grade. Some authors have pointed out a positive relation between time management and academic results, but there are few empirical studies supporting this relation (Britton & Tesser, 1991; De la Barrera et al., 2008; Macan et al., 1990; Pintrich et al., 1993; Umerenkova & Flores, 2018). Usually, academic entities encourage students to attend time management courses so that they acquire the strategies to face exams. Theory and logic lead us to believe that better time managers obtain better academic results. However, we need to obtain more data to support this idea.

Objective and subjective assessment methods

Traditionally, goal orientation and time management, as many other self-regulated learning variables, have been measured using self-reports. This methodology allows us to collect data quickly from verbal descriptions because questionnaires are easy to design and administer. However, several authors who have studied self-regulation emphasize that self-reports have limitations (e.g., Li et al., 2020; Núñez et al., 2006; Pike, 1995; Winne & Jamieson-Noel, 2002). On the one hand, participants might not know exactly how to describe themselves and therefore their responses could be inaccurate. On the other hand, their responses might be affected by biases such as social desirability. In addition, self-reports do not allow us to study the behavioral patterns of the participants (Gniewosz et al., 2020; Ortner & Proyer, 2015; Zimmerman, 2008).

As mentioned at the beginning of the introduction, there is a need for new approaches and methods to study goal orientation, time management and their relation to learning outcomes, which could lead to a better understanding of self-regulated learning. Special emphasis has been placed on the usefulness of employing a more objective methodology, and computerized instruments such as performance tests can serve this purpose (Bernacki et al., 2012; Biswas et al., 2018; De la Barrera et al., 2008; Hong et al., 2020; Jex & Elacqua, 1999; Macan, 1994; Torrano & González, 2004; Winne & Perry, 2000). Performance tests (also called objective tests; see Cattell, 1965; Ortner & Proyer, 2015) provide complementary methodologies to self-reports. Objective tests usually employ a computerized format (most of them have a game appearance) and present a situation in which participants have to perform a task. Objective tests register response patterns automatically. This methodology allows us to study the behavior as if we were observing it, but without the need for trained observers that perform manual records of the observed behavior. They are called objective tests for two reasons: different researchers using similar methods should collect similar data; and the variables assessed are not easy to fake or distort. Objective tests provide a good methodology to study behavioral patterns that can complement the data provided by other methodologies, such as self-reports (Cattell, 1965; Ortner & Proyer, 2015).

Aim of the study

The main objective of the present work is to study two of the variables that have been given great relevance in self-regulated learning models (Pintrich, 2000; Zimmerman, 2000, 2008): goal orientation and time management. We will study their relations to learning outcomes through measurements using objective tests. We will employ objective tests to assess time management and goal orientation. In addition, a behavioral task will be employed to assess learning. Finally, academic grades will be collected.

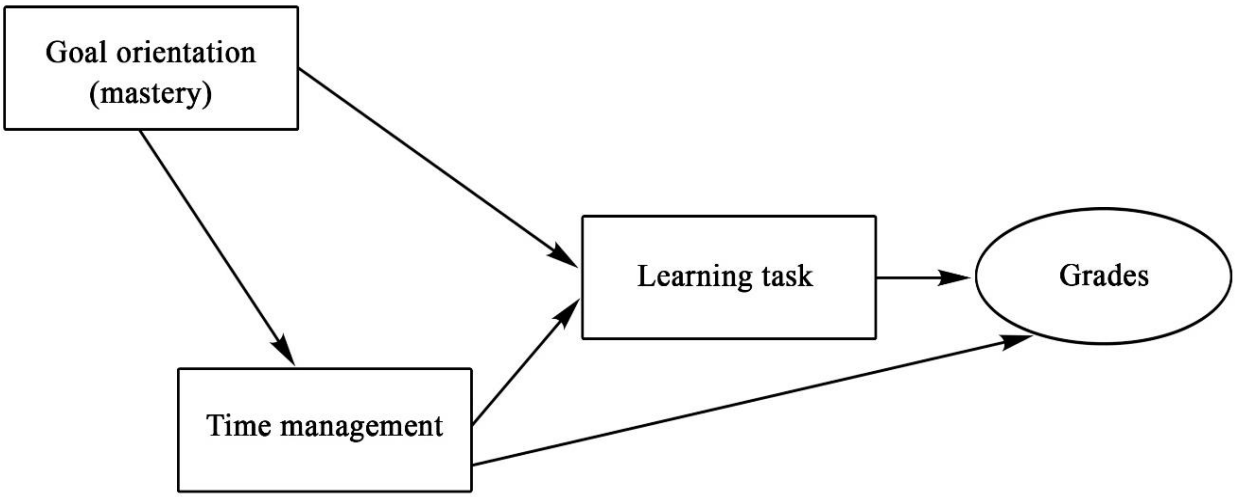
In addition to obtaining correlation coefficients, we will employ structural equation modeling to explore the relations among variables. Figure 1 depicts the hypothesized model based on theoretical descriptions and empirical studies.

We expect that goal orientation (mastery) and time management will be positively related. As mentioned above, mastery-oriented people usually show adaptative learning strategies and tend to improve their competences (e.g., Dweck, 1986; Payne et al., 2007). In the model, it is expected that mastery-orientation will have a direct effect on time management.

In addition, both goal orientation (mastery) and time management should predict the results in a learning task. Mastery-oriented people tend to learn more (e.g., Payne et al., 2007) and better time management leads to better learning results (e.g., Zimmerman, 2000).

Regarding academic results, it is expected that the scores in the learning task should predict academic grades, as having success on one learning experience seems to have an effect on other learning achievements (Schneider & Preckel, 2017). In addition, time management should predict grades, as managing to complete tasks with high values in a given time should lead to a general tendency to complete assignments and obtain better marks (e.g., Claessens et al., 2007). Finally, it is not expected that the goal orientation (mastery) variable would directly predict grades, as mastery-oriented people are not necessarily interested in obtaining better marks (e.g., Ng, 2017).

Figure 1
Hypothesized model.



Method

Participants

In order to calculate the minimum sample size required, the algorithm developed by Westland (2010) was employed. We established an anticipated effect of 0.1 (as the effect size for goal orientation and learning strategies seems to be modest; see Bernacki et al., 2012), a desired statistical power level of 0.8, and an alpha level of 0.05. The recommended minimum sample size for the proposed model was 100.

The total number of participants in the study was 204 (21 males and 183 females). They were students from a psychology degree program (age: M = 20; SD = 3). The participants received course credit for their participation. The study was approved by the research ethics committee of the Autonomous University of Madrid.

Instruments

Goal Orientation

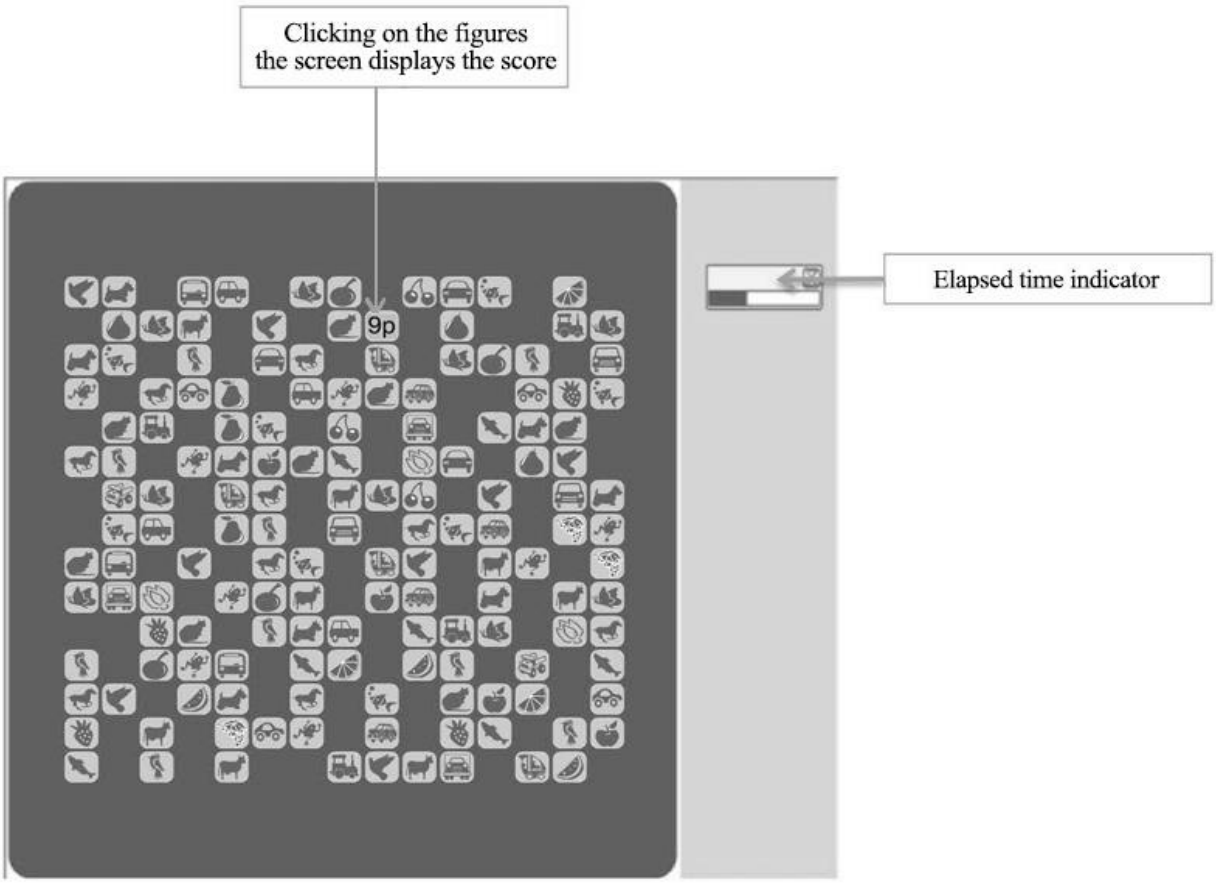
Mastery Performance-Goal Orientation Test (MP-GOT). MP-GOT objective test (Romero et al., 2020) measures individuals' mastery- and performance-orientations as described by Eison (1979), Nicholls (1984) and Dweck (1986). To our knowledge, MP-GOT is the only published objective test so far to measure these orientations. Its instructions state that the aim of the test is to get the highest number of points by using a mouse to click on various figures on a computer screen. The screen shows a 15 x 15 matrix (225 squares) with 150 figures randomly distributed (see Figure 2). Figures represent animals, vehicles, fruits and plants. When participants click on a figure, they receive a certain number of points. A category of figures (non-mammal animals) is considered the optimal-figures category, as they provide 9 points each when clicked (the highest number of points). Other categories (e.g., mammals, fruits…) provide 3, 1 or 0 points. It is possible to obtain a high number of points by two different strategies: (a) by restricting the clicks to the category of figures that provide the highest number of points or (b) by clicking on as many different figures as possible without discriminating among the categories. People who follow the first strategy are classified as mastery-oriented (as they are those who try to understand the task and learn the category that provides the highest number of points), whereas people who follow the second strategy are classified as performance-oriented (as they are those who try to achieve the best result, regardless of the level of learning they are achieving). There are 6 training trials and 6 test trials, and each of them lasts 20 seconds.

The goal orientation variable was calculated for each participant as follows: mean score of [(total points over the last six trials) / (total responses in the last six trials)]. The minimum value is close to 2.6 (the expected value of points per click if the categories of figures are ignored). The maximum value is 6.7 (the expected value if only the category items that provide the highest number of points are clicked). This variable is bipolar. Performance-oriented participants will obtain a low score, whereas mastery-oriented participants will obtain a high score.

As a higher value of the variable implies that the participant will be classified as mastery-oriented, in the text, we will name this variable "goal orientation (mastery)".

Romero et al. (2020) demonstrated reliability and validity of MP-GOT. They showed that internal consistency was high (α = 0.97-0.98) and that MP-GOT has the potential to predict learning. In the present work, reliability of MP-GOT was also high (α = 0.97).

Figure 2
Example of a display shown on each trial of the MP-GOT test (Romero et al., 2020).

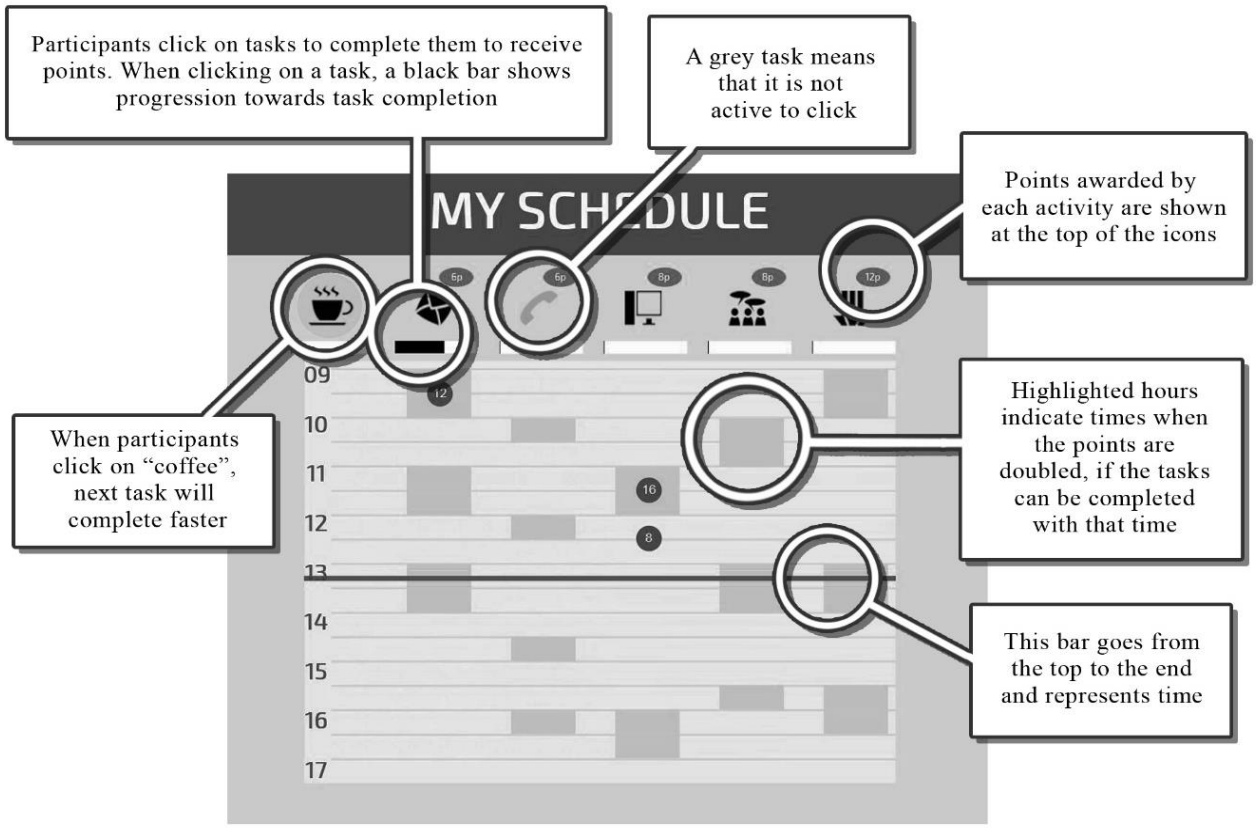


Time Management

My Schedule. This objective test was designed by Romero et al. (2021) to assess time management behaviors. It is based on the Koch and Keimans' (2002) behavioral decision-making theory, one of the theories that is gaining more ground in the time management literature. The task presents a situation in which participants have to complete office activities in a given time to obtain points (i.e., they have to manage their time to achieve a goal). The test was designed to assess time management in adults and included activities that could be familiar for office workers and university contexts (e.g., downloading documents, attending a meeting, working on the computer, etc.; see Romero et al., 2021). Activities have different values depending on the time when they are completed.

Figure 3 shows a sample of the task. It features a schedule page with hours from 9 a.m. to 5 p.m. A red bar that moves from the top to the end of the page represents time passing. There are different icons that represent activities: reading emails, answering calls, working on the computer, attending meetings, downloading documents and having a break (represented by a cup of coffee). Activities are initiated when the participant clicks on the icons. An oval shows the initial points the activity provides. A bar below the icon shows its progression. If participants complete an activity during the hours highlighted, the activity provides twice as many points.

Figure 3
Example of a display shown on each trial of My Schedule task (Romero et al., 2021).



When an activity is being completed, the rest of them are not active (so participants cannot click on them), except for downloading documents and answering calls. Downloading documents can be completed "in the background", that is, while another activity is being completed. The "answering calls" icon activates every 5 seconds. If participants click on it while another activity is being completed, it interrupts the task and they do not achieve the points it could have provided. Having a break (cup of coffee) does not provide points, but if participants click on it, it will halve the time of the next activity clicked. Table 1 describes the value of each activity according to the rules that describe their contingency relations. Participants have to decide which activities to complete and when, in order to obtain a high score. Optimal decisions are those directed to complete the activities that would allow a higher value to be achieved (see values on Table 1) if clicked in the proper time.

Table 1
Points awarded by activities of My Schedule.

	Time it consumes	Points awarded if completed	Value (Points/Time)	Value if completed on highlighted hours
Writing emails	4	6	1.5	3
Answering calls[a]	2	6	3	6
Working on the computer	4	8	2	4
Attending a meeting	4	8	2	4
Downloading documents[b]	1-12	12	12-1	24-2
Coffee (break)[c]	5	-	-	-

[a] Answering calls activates every 5 seconds.
[b] Downloading documents is available even if another task is being completed. It consumes 1 second if the participant immediately clicks on another activity or up to 12 seconds if he or she clicks on another activity when "downloading documents" ends.
[c] The function of this activity is to halve the time that consumes the next activity that participants click.

My Schedule has one training trial and eight test trials. The training trial lasts 120 seconds, and the timing bar goes from the top to the end of the schedule. Test trials last 60 seconds, and the timing bar only reaches half the schedule page (2

p.m.). Participants have to plan and choose the activities while ignoring the last hours.

The time management variable is the mean number of points obtained in test trials. In order to get the highest number of points, participants have to click on the activity that offers more value in a given time and try to do activities at the same time (complete downloading documents while doing another activity). The possible response range is 0-300 points.

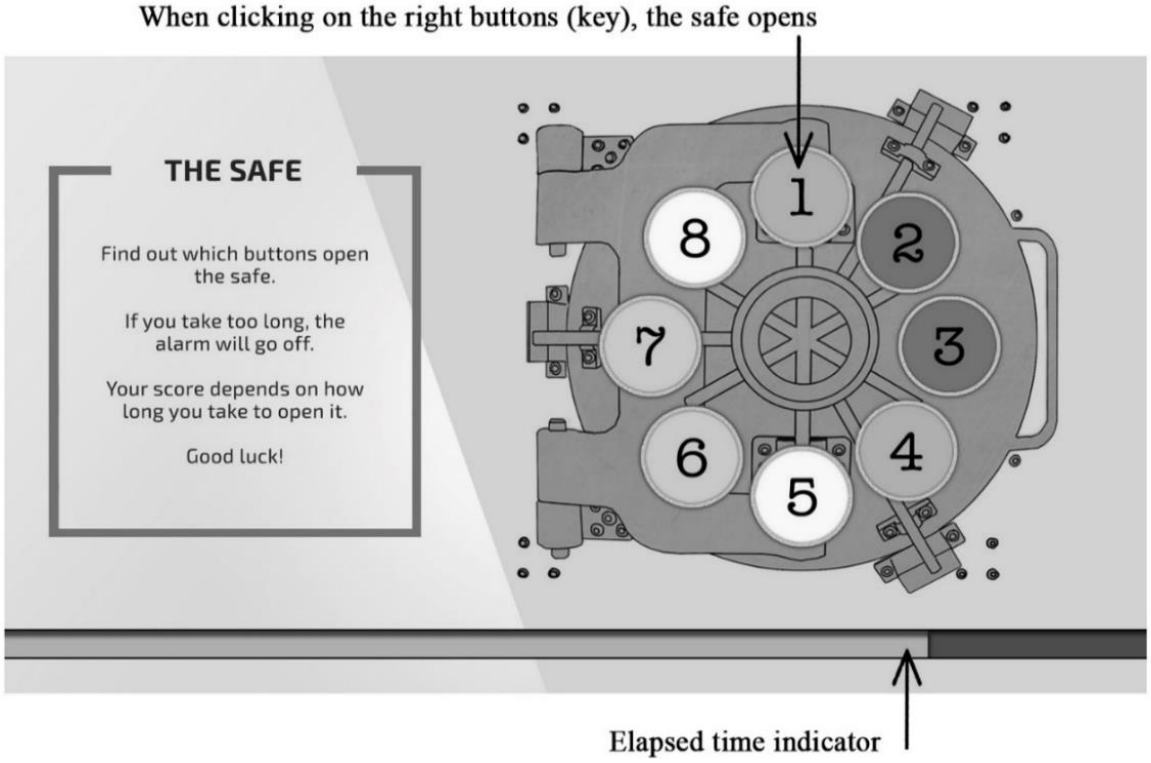
My Schedule showed high reliability (α = 0.92-0.94; test-retest (one month): r = .71) and convergence validity (Romero et al., 2021). In the present work, reliability of *My Schedule* was α = 0.93.

Learning Outcomes

In order to assess learning outcomes, we administered a learning task (*The Safe*) and collected college grades.

Learning task: The Safe. To obtain a behavioral measure of learning, we decided to employ an operant learning task designed for adults. We chose to employ *The Safe*; a computerized task based on the Pavlov system task (Santacreu & García Leal, 2000). In the text, we will describe *The Safe* as the learning task. It presents a safe with buttons on the screen (see Figure 4). The buttons can show letters or numbers. The aim of the task is to open the safe as quickly as possible by learning which are the key buttons. It has three different phases and each phase has 14 trials. In Phase 1, the safe opens if the participant presses twice on a certain button (e.g., 1, 1). An alarm will go off if he or she does not find the key in 15 seconds. In Phase 2, the safe opens if the participant presses on two different buttons (e.g., 3, 4). The alarm will go off if he or she does not find the key in 20 seconds. In Phase 3, the safe opens if the participant presses two different buttons and twice on one of them (e.g., 6, 6, 7). The alarm will go off if he or she does not find the key in 30 seconds. This task assesses if participants learn which key buttons open the safe in the shortest amount of time. The learning variable is assessed on the last two trials of the test. In the Pavlov system task (Santacreu & García Leal, 2000), participants also have to find which are the key numbers. The difference between tasks is that, in the Pavlov system task, when the participants find the key numbers they turn off a sound or a light, whereas in *The Safe*, when the participants open the safe they receive points.

Figure 4
Example of a display shown on a trial of The Safe task.



The performance on the learning task is calculated as the mean of (Clicks on Keys/Total Number of Clicks) × Remaining Time in the last two trials of the test. The response range is 0-30. High values indicate high key learning rates. The safe is opened by focusing the clicks on the key buttons quickly. In the present study, this task showed high reliability. Cronbach's alpha was 0.95.

Grades form. Participants had to fill out a form reporting

their final grades for the term. In addition, they provided a copy of their official transcript to avoid subjectivity when reporting the grades. There were no differences between the grades reported in the form and the grades of the official transcript. The academic grades collected were those that were mandatory and most related to math and science (as most of the previous works collect data for these types of subjects): neuroscience and methodology grades. The grades have a range between 0-10.

Procedure

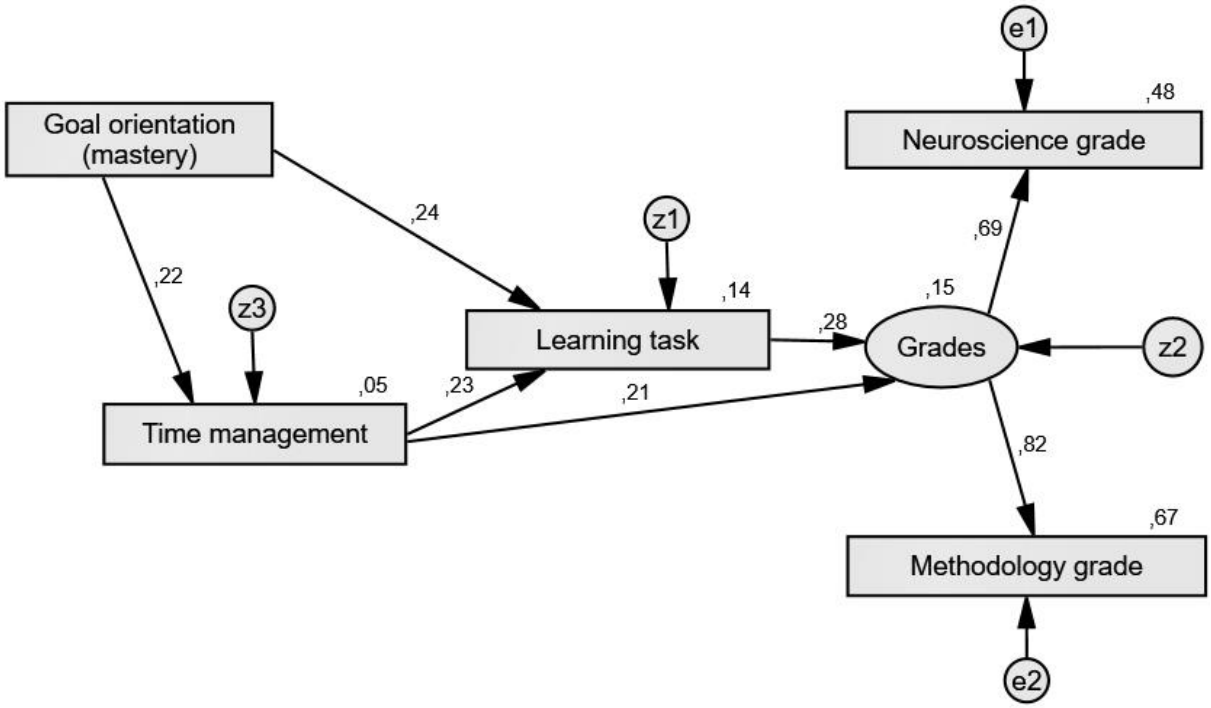
Participants first signed an informed consent document that included permission to use their anonymous data for research purposes. They had access to an online server by using a secure identification and password and completed the computerized tests on an individual computer. At the beginning of the academic year, they first completed MP-GOT. After completing it, they were provided access to complete *My Schedule*. At the end of the academic year, the participants completed *The Safe*. After completing it, they were provided the link to an online form to submit their academic grades. The participants provided their grades and a photocopy of the official transcript. Two psychologists checked that there were no differences between the grades and the official transcript. Participants received a course credit only if they completed all the tests and sent their grades. We believe that this procedure ensured that all participants finished the tests and provided their marks. Finally, data analyses were performed using SPSS 26 and AMOS 26.

Results

Structural Equation Model

The proposed model was tested using AMOS 26. Figure 5 shows the structural model. Goal orientation (mastery) has a direct and significant effect on time management (p = .001). The effect of goal orientation (mastery) is β = .22 and explains 5% of the variance of time management. The scores of the learning task receive a direct and significant effect from goal orientation (mastery; p < .001) and from time management (p < .001). Both goal orientation (mastery; β = .24) and time management (β = .23) have a similar effect on the scores of the learning task and explain 14% of the variance of the scores of the learning task. As seen in Figure 5, "grades" is a latent variable obtained based on methodology and neuroscience grades. The learning task has a significant effect on grades (p = .002). Time management also has a significant direct effect on grades (p = .02). The effect on grades from the learning task is β = .28. The effect on grades from time management is β = .21. In this model, 15% of the variance of grades is explained.

Figure 5
Model of the relations between goal orientation, time management and learning outcomes



The model provides a good fit to the data, as the Chi-square was not significant (χ^2 = 3.66, df = 3; p = .30). The other indices also showed acceptable fits. The value of the index based on Chi-square/degrees of freedom (CMIN/df) was 1.22 (values below 2 represent adequate fit; Byrne, 1994). The Root Mean Square Error of Approximation (RMSA) value was .03 (a value below .05 indicates a good fit; Browne & Cudeck, 1989). The Normed Fit Index (NFI) value was .97. The Comparative Fit Index (CFI) value was .99 (NFI and CFI values over .90 means acceptable fit (Byrne, 1994).

Correlations

Table 2 depicts the correlations between the variables measured. Results showed a significant positive relation between goal orientation (mastery) and time management, although the strength is relatively small (r = .22; p = .002). On the other hand, the scores of the learning task (*The Safe*) were significant and positively correlated with goal orientation (mastery; .29; p < .001) and time management (r = .28; p < .001). Regarding academic grades, time management showed a positive significant relation with both neuroscience (r =.18; p < .01) and methodology (r = .25; p < .001) grades. Goal orientation (mastery) showed a positive relation with neuroscience grade (r = .20; p = .004) but did not show a significant relation with methodology grade. The scores of the learning task were significant and positively correlated with both neuroscience (r = .25; p < .01) and methodology (r = .30; p < .001) grades. Finally, correlation between both grades was strong, significant and positive (r = .57; p < .001).

Table 2
Correlations between goal orientation (mastery), time management, learning and grades

	Goal orientation (mastery; MP-GOT)	Time management (*My Schedule*)	Learning (*The Safe*)	Neuroscience grade	Methodology grade
Goal orientation (mastery; MP-GOT)	1				
Time management (*My Schedule*)	.22**	1			
Learning (*The Safe*)	.29**	.28**	1		
Neuroscience grade	.20**.	.18**	.25**.	1	
Methodology grade	.13	.25**	.30**	.57**	1

*p < .05
**p < .01

Discussion

Self-regulated learning models attempt to represent proactive behaviors that are beneficial for learning. Authors such as Pintrich (2000) and Zimmerman (2000, 2008) have underlined in their models the relevance of goal orientation and time management. In addition, several others (e.g., Hong et al., 2020; Panadero, 2017; Torrano & González, 2004; Winne & Perry, 2000) have highlighted the need to study self-regulated learning using new approaches and methods. From a behavioral approach, in the present work we aimed to study the relation between goal orientation, time management and learning outcomes through the use of objective tests.

Based on the literature review, we hypothesized a model regarding the relations between goal orientation, time management and learning outcomes. The results showed that the model fits the data, and the findings are in accordance with the reviewed literature. The model shows that objective measures of goal orientation (mastery) have a significant direct effect on objective measures of time management. Goal orientation and time management play important roles when people engage in learning activities. Self-regulated learning models are based on the assumption that learners establish a goal and actively direct their behavior to achieve it. Usually, goals should be achieved within a specified period of time, so learners have to manage their time efficiently in order to succeed (Efklides, 2011; Pintrich, 2000; Zimmerman, 1996). Mastery-oriented people tend to use adaptative learning strategies and improve their skills (Bernacki et al., 2012; Day et al., 2003; Dweck, 1986; Payne et al., 2007; Ranelluci et al., 2015), which would favor their time management competence to be higher.

The model also shows that objective measures of goal orientation (mastery) have an effect on academic performance, but indirectly, through learning. Mastery-oriented students would be more motivated to learn, but are not as interested or concerned about grades (Ng, 2017; Ranelluci et al., 2015). However, their attempts to learn should have a positive impact on academic grades. These students will have to perform tasks in the process, they will improve their competences, and even if they were not necessarily interested in improving their grades, their learning process could be translated into better academic grades.

On the other hand, the model shows that objective measures of time management are related to learning and academic performance directly. This result is also in line with the reviewed literature, which highlights that time management strategies tend to promote better learning outcomes (e.g., Britton & Tesser, 1991; Macan et al., 1990; Pintrich et al., 1993). People who are able to complete high-value tasks efficiently are those who are also able to achieve higher levels of learning. In addition, to be successful in the educational system it is necessary for students to complete tasks within a deadline. Thus, showing efficient time management behaviors has a direct effect on grades.

Finally, the grades variable received an effect from the learning task. This result is in line with the assumption that learning experiences have an effect on other learning achievements (Schneider & Preckel, 2017). In general, the coefficients obtained in the model are low (.21 to .28) but are higher than the values obtained in previous works, which are usually about .10 or less (see Bernacki et al., 2012).

In the present work, we have focused on goal orientation and time management, and we have demonstrated that our behavioral measures of self-regulated learning variables are related to learning outcomes. Our aim was to verify the existence of this relation by obtaining measurements through objective tests. The present findings provide empirical support for self-regulated learning models and warrant further exploration of self-regulation from a behavioral approach.

In addition, our results complement the data offered in previous empirical studies, which have predominantly employed self-report measures. Previous studies have shown that self-reported mastery orientation is positively related to self-reported time management (r = .39-48; Luo et al., 2011; Magno, 2012; Ranelluci et al., 2015; Won et al., 2018). The present study complements previous ones by showing that a behavioral measure of mastery-orientation is positively related to time management behaviors (r = .22). In this case, the correlation value found from objective measurements is lower than those found from self-reports. It seems that the relation between verbal descriptions might be stronger than the relation between manifested behaviors.

On the other hand, previous works have shown that self-reported time management is positively related to academic outcomes (r = .20-39; Britton & Tesser, 1991; De la Barrera et al., 2018; Macan et al., 1990; Pintrich et al., 1993), and our work shows that when we measure time management behaviors through an objective test, we also find a positive relation with academic achievement (r = .18-25).

Psychological assessment guidelines indicate that it is necessary to use different methods to provide a more complete understanding of a construct (Fernández-Ballesteros et al., 2001). Objective tests and self-reports are complementary, as they measure different aspects of the same variable. Self-reports measure people's verbal synthesis of their behavior, whereas objective tests collect the synthesis of the person's learning history (Ortner & Proyer, 2015; Santacreu et al., 2002). They are not competing measures, and we are not suggesting that one is better than the other. Instead, out results complement those of self-reports, and we aim to add them to the effort of providing a more complete view of the variables studied.

When it comes to the relation between goal orientation (mastery) and academic grades, we did not expect to find a significant relation. Our results show that the relation between goal orientation (mastery) and the methodology grade was not significant. In contrast, the relation between goal orientation (mastery) and neuroscience grade was positive and significant (.20). Some studies that have employed self-reports have also found an absence of significant relations between mastery-orientation and academic achievement (e.g., Elliot & Church, 1997; Ng, 2017; Ranelluci et al., 2015), and the studies that have obtained significant relations have found values similar to the value reported in the present work (r = .11-.22; Patrick et al., 2007). Our findings support the assumption that mastery-orientation might not always result in the achievement of higher grades (Ng, 2017; Ranelluci et al., 2015). Our aim was not to determine whether any specific types of verbal descriptions or behavioral patterns are more predictive of the relation between mastery-orientation and academic grades. To improve this prediction, it would be appropriate to conduct new studies that include other variables that are relevant to academic performance (e.g., intelligence level).

When examining the correlation between the scores of the behavioral learning task (*The Safe*) and academic grades, we found low to moderate values (.25 and .30). They are not exactly the same measure: *The Safe* task requires learning which keys open a safe before an alarm goes off, whereas academic grades include the grades obtained doing essays and examinations. However, we should expect them to be positively related, as indeed they are.

When assessing learning by using the behavioral learning task (*The Safe*), goal orientation (mastery) showed a significant positive correlation. Mastery-orientation could promote higher learning in this task, as mastery-oriented people are interested in learning and tend to consider tasks as challenges. On the other hand, time management also showed a positive significant relation with the scores on the learning task. In this task, participants have to manage their time and find the key in the shortest time if they do not want the alarm to go off. Therefore, time management skills could also promote higher learning in the learning task.

The theoretical implications of our work are summarized as follows. The findings provide empirical support for the self-regulated learning models. Results show that there is a significant relation between mastery-orientation and time management measured objectively, which justifies their joint consideration in self-regulated learning models. Mastery-orientation and time management have been found to predict learning-related outcomes. When students show a mastery-orientation, they tend to manage their time better, and it is observed an effect on learning outcomes, such as performance on a learning task and academic grades. The findings also provide confirmation for theories that study goal orientation and time management independently of these models, especially for the latter since, as indicated in the introduction, there are relatively few studies exploring the importance of time management skills. Furthermore, increased relevance of our findings arises from the fact that these results have been based on objective tests. To our knowledge, this is the first work to employ objective tests to assess the relation between time management, goal orientation and learning outcomes. We have addressed the need for new measures to assess these variables (e.g., Bernacki et al., 2012; Macan, 1994; Panadero, 2017). Results complement the information obtained

from other studies that have assessed these variables using less objective measures (e.g. Britton & Tesser, 1991; Luo et al., 2011; Magno, 2012; Ranelluci et al., 2015; Steinmayr et al., 2011, 2019; Won et al., 2018) and contribute to obtaining a more comprehensive understanding of self-regulated learning. The data obtained from the verbal description of behavior and from objective measures allow us to study different facets of the same construct. The advantage of the latter is that they are objective for participants and free from inaccurate or distorted descriptions.

The present study also has practical implications. The findings indicate that mastery-oriented people are those who manage their time better, while performance-oriented people often find it more difficult to manage their time efficiently. Thus, performance-oriented students could be those who would benefit most from training programs to improve time management. On the other hand, the fact that time management has a direct effect on learning and academic grades implies that this variable should continue to receive attention in the educational field. Although more research is needed, time management training is likely to be beneficial in achieving better educational outcomes. In any case, it would be of interest to promote a mastery-orientation in educational contexts, as this type of orientation could promote higher levels of learning. To promote a mastery-orientation, it is appropriate for students to focus on understanding the process, instead of on the final outcome. If students make an effort to understand the process, this will have an indirect impact on the outcomes, through learning. The objective tests employed here may be used as complementary measures to self-reports and other methodologies to provide a more comprehensive assessment of goal orientation and time management, which could benefit educational programs.

We hope that our work will serve as a starting point to encourage further research. In future studies, the inclusion of other variables in the model could be considered. We propose that, for future studies, it could be interesting to add to the model variables such as help-seeking and cooperation, since self-regulation models also emphasize that these variables have an effect on students' achievement (e.g., Pintrich, 2000; Zimmerman, 2000). Nevertheless, we should not forget that the inclusion of multiple variables can make it difficult to interpret the results (see Bandalos, 2006).

On the other hand, in future studies, it will be necessary to continue exploring learning outcomes to determine if the present model can be supported in other contexts. It would be appropriate to obtain learning indicators from tasks different than the one employed in here. In our work, we employed *The Safe,* a task that allows us to observe and register students' performance. It represents a specific artificial situation of a certain complexity. It would be appropriate to conduct future studies using *The Safe,* but also other operant learning tasks, such as the *Treasure Forest* task (see Romero et al. 2020). Future studies should also explore other academic achievement in other disciplines as well, perhaps by collecting overall Grade Point Averages.

Finally, it is important to point out that the main limitation of this work relates to the generalization of the results. The participants are psychology students and the sample consisted of an unequal percentage of women and men. In order to know whether these data are generalizable, it would be necessary to replicate this study with samples of students from different educational levels and areas, and in which the percentage of women and men is balanced.

In short, the greatest achievement of this work lies in the use of objective measures to study goal orientation and time management objectively. To date, we have not found any studies that employ objective tests to measure the variables studied in this work. We encourage researchers to employ objective measures to broaden our knowledge about the role of goal orientation and time management in learning activities.

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