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Exploring Factors Predicting Undergraduate Healthcare Students' Use of Learning Strategies

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Abstract: The present study aimed to investigate the relationship between students' academic motivation, implicit beliefs about intelligence and learning strategies among undergraduate healthcare students. First-year students of healthcare degree courses from a university in Southern Italy were surveyed. The study measured psychological constructs by means of Academic Motivation Scale, Motivated Strategies for Learning Questionnaire, and Dweck's implicit questions about beliefs of intelligence. Two regression models were computed to assess the association between students' beliefs about intelligence, motivations for studying, and learning strategies. In the first regression model, predicting students' use of cognitive strategies from implicit intelligence beliefs and motivations for studying, stronger autonomous motivations were significant predictors of cognitive strategies. The second regression model, predicting students' use of metacognitive strategies from implicit intelligence beliefs and motivations for studying, was not significant. These findings can be useful to plan tailored educational interventions to promote students' motivation, incremental beliefs about intelligence and their use of learning strategies positively related with academic performance.

Keywords: *Implicit theories, learning strategies, academic motivation, self-determination theory, undergraduate students.*

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Introduction

It is important to investigate university students' approaches to learning, motivational factors and beliefs since these factors are recognized as predicting academic performance (Richardson et al., 2012). Previous studies focused on this issue from different perspectives. Motivation and self-regulation have been widely explored (Elliot et al., 1999; Liu et al., 2014; Manganelli et al., 2019) along with their relation to beliefs about intelligence in educational contexts (Bodill & Roberts, 2013; Dinger & Dickhäuser, 2013; Elliot & Dweck, 2005; Haimovitz et al., 2011), but there is a paucity of research investigating all these factors simultaneously (Mouratidis et al., 2017). In a study with high school students, autonomous motivation was positively correlated with learning strategies, and negatively correlated to homework procrastination, among students with incremental beliefs (Mouratidis et al., 2017).

In this study, we observed students attending the first year of two different health-sector university courses because it is considered a crucial transition period, affecting several students' outcomes such as retention and academic performance, given the challenges that need to be faced at the entrance in a novel educational context (Messineo et al., 2019; Pitkethly & Prosser, 2001; Tinto, 1993; Yorke & Longden, 2004). We measured learning motivation, self-regulated learning and beliefs about intelligence of first-year university students of two different health science curricula to assess the relationships between these constructs. Learning motivation was investigated within the theoretical framework of self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2000). The students' adoption of self-regulated learning was explored within the framework outlined by Pintrich and de Groot (1990). The beliefs about intelligence were investigated within the implicit theory of intelligence developed by Dweck et al. (Dweck, 1999; Dweck et al., 1995; Dweck & Leggett, 1988).

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Literature Review

Self-determination theory

According to SDT, motivation is a complex process which varies in kind, and not a unitary concept which varies just in quantity (Deci & Ryan, 2000). Different types of motivation along a continuum, considering the *why* of the behaviour, are identified: *amotivation, extrinsic motivation, and intrinsic motivation*. Authors also consider the *what* of the behavior which refers to specific content of the student motivation. *Amotivation* is the state of absence of intention to behave (Ryan & Deci, 2000). When amotivated, students are neither intrinsically nor extrinsically motivated, and they lack a sense of control over a study-related activity.

In the educational context, *extrinsic motivation* refers to studying for external motives and reasons. Extrinsic motivation is differentiated into four types of regulation that vary in their amount of relative autonomy: *external*, *introjected*, *identified,* and *integrated* (Ryan & Deci, 2000). The different types of regulation reflect differences in students' levels of autonomy, and the continuum of motivation varies in terms of the extent to which a goal-directed activity is undertaken by students with a complete sense of choice and volition. Specifically, motivation can be classified taking into account the degree to which it is non-self-determined versus self-determined. *External regulated motivation* is low in self-determination, with actions being performed to pursue a specific external contingency, such as achievement of an external reward or avoidance of a negative consequence. The control of the goal-directed activity is completely external. The subjective experience is characterized by a sense of incompetence and a lack of worth for the activity. *Introjected regulation* refers to students that pursue a goal-directed activity for specific personal contingencies. Though control and regulation are internal, the activity is not considered an expression of the self. External and introjected regulations are categorized as *controlled motivation*.

Identified regulation is a relative autonomous form of extrinsic motivation. Identification is a process through which students identify the value of an activity. The control is relatively internal, and the regulation is more internalized. *Integrated regulation* is the most autonomous form of extrinsic motivation and shares some characteristics with intrinsic motivation. Integration is a process through which students assimilate the reasons behind an activity. Though regulation and control are internal, the activity is performed to achieve outcomes that are different from the activity itself. Identified and integrated regulations are classified as *autonomous motivation* as they are high in self-determination; the origin of an action is perceived from the self, and students feel themselves capable of performing an activity. *Intrinsic motivation* is the prototype of autonomous regulation. Intrinsically motivated students perform an action for their inherent interest and enjoyment in performing that activity. The purpose of the behavior is the activity itself. According to SDT, people are intrinsically motivated to act when they autonomously choose meaningful activities that sustain self-expression and permit them to feel competent.

Research has highlighted that autonomous motivation is associated with the use of deep cognitive learning strategies (Kusurkar et al., 2013; Vansteenkiste et al., 2004). Furthermore, autonomous motivation profiles are associated with more successful learning outcomes, over time, than controlled motivation (Niemiec & Ryan, 2009; Taylor et al., 2014).

Self-regulated learning

Self-regulated learning (SRL) helps to understand student learning by taking into account cognitive, motivational, and emotional aspects of learning. SRL refers to specific self-directed processes aimed at activating personal resources, such as abilities, knowledge, actions, and emotions to pursue a specific learning goal (Pintrich, 2004; Zimmerman, 2011). Self-regulated students define their learning objectives and choose the most suitable learning strategies to achieve them. There are different models of SRL, and they share some general assumptions (Panadero, 2017). SRL models state that the nature of student learning is constructive, and students are assumed as active participants in the learning process. Learners construct their own learning objectives and use metacognitive strategies for planning, monitoring and regulating their cognition, motivation, and behavior to reach their goals. Another important component of SRL is the students' management and control of their efforts to learn. Moreover, self-regulatory activities act as mediators between personal characteristics and academic performance.

In the present study, we refer to Pintrich's model of SRL (Pintrich & de Groot, 1990) which is different from other models, in that Pintrich also analyses the relationship between SRL and motivation (Pintrich et al., 1993). Therefore, to be effective in a learning context, students need to have both the 'will' and the 'skill' (Pintrich & de Groot, 1990). Intrinsic motivation and a high level of self-efficacy are crucial aspects for an actual learning activity. The students' use of learning strategies as formulated by Pintrich's model is assessed via the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1993). Studies have identified different cognitive strategies that undergraduate students use to regulate their knowledge. Elaboration, organization, rehearsal, critical thinking, and monitoring are the essential strategies to regulate the learning process (Richardson et al., 2012). In the rehearsal strategy, essential information is chosen and highlighted by taking notes or by repeating it as a way of remembering and learning. This strategy helps students activate working memory and affects attention and encoding processes. Elaboration strategies allow students to store information into long-term memory by making connections between different sources of information. Examples of elaboration strategies include paraphrasing, summarizing, making connections, etc. The

organization strategies permit students to organize learning materials through the internal construction of connections between their inter-relationships. The critical thinking strategy is concerned with the process of inquiring and judging the learning material. Self-monitoring, planning, and flexibility refer to the metacognitive processes utilized to control the learning practice and modify cognitive strategies if necessary. Many research studies have shown a positive relation between the use of learning strategies and academic achievement (Duncan & McKeachie, 2005; Liu et al., 2014; Pintrich & de Groot, 1990). Although many previous studies have investigated the relationship between intrinsic motivation and self-regulated learning, few explored the factors of MSLQ in association with SDT constructs (Liu et al., 2014; Vansteenkiste et al., 2009). The difference in self-regulated learning based on MLSQ was investigated in Liu et al. (2014). Two adaptive clusters showing better academic performance were uncovered based on the MSLQ (Liu et al., 2014). A positive correlation was found between autonomous motivation and environment use, and effort regulation and metacognitive strategy in Vansteenkiste et al. (2009).

Implicit theory of intelligence

According to the Dweck's self-theory, there are different types of implicit beliefs about specific domains that are relevant for interpreting human actions and thoughts in an implicit way (Dweck, 1999). In the intellectual domain, there are people who believe that intelligence is an unchangeable fixed ability. These people hold an entity theory about their intelligence. Entity theorists tend to attribute their successes or failures to external or uncontrollable causes, such as task difficulty or luck. This belief has consequences for students who tend to adopt performance-oriented goals (Burnette et al., 2013). On the other hand, people who hold an incremental theory of intelligence or growth mindset believe that their intelligence is not a stable trait which they merely possess in a fixed measure, but it is a malleable ability which they can change and improve through learning. Students with an incremental theory of intelligence attribute academic success to internal and controllable causes such as effort and academic difficulties to lack of effort. A recent meta-analytic review showed that incremental theorists are more likely to have positive academic outcomes (Costa & Faria, 2018).

Some studies have investigated the relation between implicit beliefs and the use of self-regulated learning. In a study, students with incremental beliefs have been found to use more effective study strategies (Jones et al., 2012). Moreover, in a meta-analysis a positive correlation between incremental beliefs about intelligence and self-regulatory processes was found (Burnette et al., 2013). Very few studies investigated the relation between academic motivation, learning strategies and implicit theory of intelligence. In a study with high school students, authors found that autonomous motivation was positively correlated with learning strategies, and negatively correlated to homework procrastination, among students with incremental beliefs (Mouratidis et al., 2017).

Methodology

Research Goal

The aim of the current study was to assess the relationship between academic motivation, implicit theories of intelligence and learning strategies among first-year healthcare university students. More specifically, the study sought to evaluate the association of students' academic motivations and implicit theories of intelligence with the use of both cognitive and metacognitive learning strategies. We hypothesized that autonomous motivation would be associated with a greater students' tendency towards the use of cognitive and metacognitive learning strategies. We also hypothesized a positive association between students' incremental beliefs about intelligence and their attitude towards the use of learning strategies.

Sample and Data Collection

The present study was carried out at the medical school of a university in Southern Italy. All first-year students of two health-sector degree courses, physiotherapy and health assistance (N = 58) were invited to participate in the study. We communicated the study design to the coordinators of the two-degree courses, and we ensured that ethical standards would be met, in compliance with the Declaration of Helsinki, and in accordance with the Psychology Ethical Code. The students were informed about the aim of the study and were asked to give their voluntary written consent. Students filled out a questionnaire after class time.

Measures

The participating students answered a two-part questionnaire. First part of the questionnaire gathered information on students' demographic aspects. The second part of the questionnaire included self-report scales to measure academic motivation, learning strategies, and implicit beliefs about intelligence.

Implicit theories of intelligence. The standard version of the three-item measure by Dweck (1999) was used to assess students' implicit theories of intelligence. Three items about intelligence from the Study Ability and Motivation test (AMOS) were used (De Beni et al., 2003). The items are rated on a six-point Likert-type scale (1 = strongly agree; 6 = strongly disagree). An average score was computed with lower scores indicating stronger beliefs about intelligence as a

fixed entity and higher scores suggesting beliefs about intelligence as malleable and modifiable over time. Previous research has shown that the measure can be considered a reliable and valid measure of implicit beliefs about intelligence (Dweck et al., 1995). Cronbach's alpha was 0.85 in the current sample.

Motivation for studying. The Academic Motivation Scale (AMS) was adopted to evaluate the quality and quantity of motivation for studying (Vallerand et al., 1992). It is a self-report questionnaire composed of five subscales, assessing individual's regulation of motivation within the SDT framework. We used an Italian validated version of the AMS (Alivernini & Lucidi, 2008). Each subscale is composed of four items with each item being a possible answer to the question 'Why do you go to college?', revealing the different types of motivation: amotivation, external regulation, introjected regulation, identified regulation, and intrinsic motivation. Response choices for each item were rated on a 5-point Likert scale from 1 (does not correspond at all) to 5 (corresponds exactly). Following previous research (Manganelli et al., 2019; Vansteenkiste et al., 2009), scores for autonomous motivation were derived by summing up average scores on the intrinsic motivation and identified regulation subscales. Similarly, scores for controlled motivation were computed by summing the average scores on the external and introjected regulation subscales. The questionnaire has shown to have good psychometric properties (Fairchild et al., 2005). Cronbach's alphas in the current study were 0.85 for both controlled and autonomous motivations.

Learning strategies. Selected subscales from the Motivated Strategies for Learning Questionnaire (MSLQ) were administered to evaluate the learning strategies of the students at the beginning of their studies (Moretti et al., 2018; Olivari et al., 2015; Pintrich & de Groot, 1990). The questionnaire comprises a set of items rated on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Specifically, we selected the cognitive and metacognitive scales to derive a measure of the students' use of both cognitive and metacognitive strategies. The cognitive scales assess students' use of learning strategies for processing textual information: rehearsal, organization, elaboration, and critical thinking. A total score of cognitive strategies was computed as the average value of the four scales measuring cognitive strategies (Vansteenkiste et al., 2009). The metacognitive control strategies were assessed through the administration of the metacognition scale which measures metacognitive self-regulation. The MSLQ has proven to be a reliable and valid tool to measure learning strategies among university students (Credé & Phillips, 2011). Moreover, according to the results of this meta-analytic review, the intercorrelations between the metacognitive self-regulation subscale and the four subscales measuring the cognitive learning strategies (rehearsal, organization, elaboration, and critical thinking) ranged from 0.66 and 0.82. These findings suggest that the MSLQ metacognitive and cognitive subscales measure distinct although interrelated constructs. In the current study, Cronbach's alpha for cognitive strategies and metacognitive strategies was 0.81 and 0.59, respectively.

Analyzing of Data

Descriptive statistics for data on socio-demographic characteristics were expressed as means and standard deviations, frequencies, and percentages. Pearson correlation (r) was computed to assess bivariate correlation between variables of the study: academic motivation, learning strategies and implicit theories of intelligence. Two multiple regression models were used to evaluate the relationship between students' implicit beliefs about intelligence, motivation for studying, and cognitive and metacognitive strategies. Specifically, a regression model was built with beliefs about intelligence and controlled and autonomous motivations as predictors, and cognitive strategies' total scores as the outcome variable. A second regression model was run with beliefs about intelligence and controlled and autonomous motivations as predictors, and metacognitive strategies' total scores as the outcome variable. Normality of the distributions of variables was checked and no relevant violations of the assumption were found. Moreover, linearity was evaluated through the visual inspection of the bivariate scatterplots for all the two dependent variable pairings and this assumption appeared to hold reasonably well (Tabachnick & Fidell, 2007).

Results

A total of 54 students (28 females and 26 males) participated in the study with a mean age of 21.06 years (SD = 3.81). They were students attending the first year of physiotherapy (n = 20) and health-assistance degree courses (n = 34). The mean age of the health assistance students (M = 21.65, SD = 4.68) was slightly higher than the mean age of the physiotherapy students (M = 20.05, SD = 0.94). With regard to the gender distribution, most of the participants from the health assistance degree course were females (n = 23; 68%). On the contrary, participation of males was predominant (n = 15; 75%) from the physiotherapy degree course.

The bivariate correlations between the variables of the study are shown in Table 1. Students' implicit intelligence beliefs were associated with controlled motivation, with stronger beliefs about intelligence as modifiable related to decreasing levels of controlled motivation. Autonomous motivations were positively associated with both cognitive and metacognitive strategies, with increasing levels of autonomous motivations related to a greater use of both cognitive and metacognitive strategies.

Table 1. Bivariate correlations between all variables

Variable	1.	2.	3.	4.	5.
1. Implicit theory of intelligence	—				
2. Autonomous motivation	–0.11	—			
3. Controlled motivation	–0.31*	0.31*	—		
4. Cognitive strategies	–0.09	0.44***	0.08	—	
5. Metacognitive strategies	–0.02	0.31*	0.25	0.56***	—

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results of the two regression models are reported in Table 2. The first regression model, predicting cognitive strategies' total scores from implicit intelligence beliefs and motivations for studying, significantly accounted for 20% of the cognitive strategies total scores variability (corrected $R^2 = 0.15$, $F(3, 50) = 4.182$, $p < 0.01$). In this model, stronger autonomous motivations were significant predictors of students' use of cognitive strategies ($\beta = .46$, $p < .01$). The second regression model, predicting metacognitive strategies' total scores from implicit intelligence beliefs and motivations for studying, was not significant (corrected $R^2 = 0.08$, $F(3, 50) = 2.425$, $p = 0.08$). However, a trend for significance was found for the positive association between autonomous motivations and the use of metacognitive strategies ($\beta = 0.26$, $p = 0.07$).

Table 2. Regression analyses predicting cognitive and metacognitive strategies from implicit intelligence beliefs and motivation for studying

	Cognitive Strategies	Metacognitive Strategies
Predictors	**β**	**β**
Implicit theory of intelligence	–0.06	0.07
Autonomous motivations	0.46**	0.26[a]
Controlled motivations	–0.09	0.20
Total R^2	0.20**	0.13
Corrected Total R^2	0.15**	0.08

R^2 = variance; Corrected Total R^2 =Variance corrected for the number of predictors;
β = Standardised regression coefficient
* $p < 0.05$; ** $p < 0.01$; [a] $p = 0.07$

Discussion

The present study was designed to examine the association of academic motivations and implicit theories of intelligence with the use of both cognitive and metacognitive learning strategies among students attending the first year of physiotherapy and health-assistance degree courses. In general, the findings of this study are partially in agreement with the results of previous research. A study of Vansteenkiste et al. (2009) found a positive correlation between autonomous motivation and the use of both cognitive and metacognitive strategies. Similarly, a positive relationship between autonomous motivation and the use of good study strategies is supported by other studies (Kusurkar et al., 2013; Sobral, 2004). In a more recent study, dental students with high intrinsic motivation profile showed higher scores for deep study strategies (Orsini et al., 2018). Our results seem to confirm the hypothesis that autonomous motivation positively impacts students' use of good cognitive study strategies. Namely, stronger autonomous motivation was significantly associated with a greater use of cognitive strategies. On the contrary, the results from the second regression model did not provide support to the hypothesis of a positive association between students' incremental beliefs about intelligence and motivations for studying, and their attitude towards a greater use of metacognitive strategies. However, despite a non-significant overall model, a trend for significance was found for the association between autonomous motivation and metacognitive strategies. Although autonomous motivation correlated positively with the use of metacognitive strategies in the bivariate analysis, only a trend for significance was found for this relationship in the regression model, where the independent contribution of each predictor was assessed. Moreover, showing a different trend from existing research, the magnitude of the contribution of controlled motivation in predicting the use of metacognitive learning strategies seems to be comparable with that of autonomous motivation. Given the small sample size of this study, future studies with larger sample sizes may be useful in providing additional evidence for the predictive role of different academic motivations regarding students' use of metacognitive strategies.

In examining the association between implicit theories of intelligence, self-regulatory learning processes, and self-determined motivation, we observed some discrepancies with the existing literature. Results showed that students' incremental beliefs about intelligence were related to a decreasing relevance of controlled motivation. A significant negative association between students' beliefs about intelligence and controlled motivations was showed. This result is in line of the existing literature (Renaud-Dubé et al., 2015). Differently from previous studies, the implicit theory of intelligence was not associated with autonomous motivations. For example, in a study with primary school and middle school students, growth mindset was positively associated with intrinsic motivation and identified regulation, and external regulation was negatively associated with growth mindset (Zhao et al., 2018). Unlike previous research, the

implicit theory of intelligence was not significantly related to cognitive learning strategies in the current study. Some studies have investigated the relation between implicit beliefs and the use of self-regulated learning. Students with incremental beliefs have been found to use more effective study strategies (Jones et al., 2012). Moreover, in a meta-analysis of Burnette et al. (2013), a positive correlation between incremental beliefs about intelligence and self-regulatory processes such as goal operating and goal monitoring was found. To the best of our knowledge, no research has been done on the association between incremental beliefs of intelligence and the use of metacognitive learning strategies. The relation between implicit theory of intelligence and the use of cognitive and metacognitive self-regulated learning should be explored in future studies.

Though different studies have highlighted the importance of investigating university students' psychological factors, such as motivation, implicit beliefs, and learning strategies, which predict academic performance (Bonsaksen et al., 2017; Costa & Faria, 2018; Kusurkar et al., 2013; Manganelli et al., 2019; Richardson et al., 2012; Taylor et al., 2014), very few have explored the factors of MSLQ in association with SDT constructs (Vansteenkiste et al., 2009). Furthermore, very few studies investigated the relation between these variables and implicit theory of intelligence (Mouratidis et al., 2017). Therefore, this study is a step forward in the direction of understanding the relationship between all these variables.

Conclusion

In the present study, the relationship between academic motivation, implicit theory of intelligence, and self-regulated learning processes was explored. In summary, the results suggest that autonomous motivation was related positively to the use of cognitive strategies, while students' beliefs about intelligence were found to be not significant predictors. On the other hand, both motivations for studying and beliefs about intelligence were not significant predictors of students' use of metacognitive strategies.

Recommendations

The practical importance of the study includes the possibility to examine the relationship between specific constructs, such as students' motivational dispositions, study strategies, and beliefs, that are associated with successful learning performance (Niemiec & Ryan, 2009; Richardson et al., 2012; Taylor et al., 2014). It is expected that autonomous motivation profiles are associated with more successful learning outcomes, over time, than controlled motivation profiles (Niemiec & Ryan, 2009; Taylor et al., 2014). Furthermore, it is expected that autonomous motivation is associated with the use of deep cognitive learning strategies (Kusurkar et al., 2013; Vansteenkiste et al., 2004). Studies show also that the use of learning strategies is positively related to academic achievement (Duncan & McKeachie, 2005; Liu et al., 2014; Pintrich, & de Groot, 1990). Educational institutions should dedicate more attention to create conditions directed to sustain freshmen students' motivation (Reeve, 2002), to promote incremental beliefs about intelligence and foster learning strategies positively associated with academic performance.

Limitations

Some limitations of the present study should be acknowledged. First, caution should be used when generalizing the current results given the small number of participants in the present study. Moreover, the study included only participants recruited in two health-sector degree courses of a single university. Therefore, a larger sample including students from different academic institutions and health-sector courses should be used. Second, the regression model computed to evaluate the independent association of theory of intelligence and motivation with metacognitive strategies was not significant and only a trend for significance was found for the predictive role of autonomous motivation. Again, the model and its exploratory results should be replicated in a larger and more representative sample of health sector university students. Third, it should be noted that only self-report measures of cognitive processes were used in the current study; thus, potentially introducing biases such as those related to social desirability. Implicit measures, especially for theory about intelligence, may be used to significantly decrease the risk for potential biases. Finally, the study was observational, and no causal relationship could be inferred.

Authorship Contribution Statement

Messineo: Conceptualization, design, data acquisition, data analysis / interpretation, drafting manuscript, final approval. Tosto: Statistical analysis, data analysis / interpretation, drafting manuscript, final approval. Allegra: Supervision, critical revision of manuscript, final approval.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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