

# Do Critical Thinkers Drink Too Much Alcohol, Forget to Do Class Assignments, or Cheat on Exams? Using a Critical Thinking Measure to Predict College Students' Real-World Outcomes

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**Abstract** Critical thinking is a higher-order way of reasoning composed of the skill and will to use cognitive abilities and knowledge on a daily basis. It is identified as essential by higher education institutions, corporations, and society in general. To analyze whether college students are critical thinkers in their daily lives, the Halpern Critical Thinking Assessment (HCTA; Halpern in Halpern Critical Thinking Assessment (Measurement instrument), Schuhfried, Mödling, 2012) and the real-world outcomes inventory (RWO; Butler in Appl Cogn Psychol 26(5):721–729, 2012) were administered to 238 students. We performed a cluster analysis (*K*-means-constrained clustering method), and ANOVAs for each cluster solution tested to identify the most suitable clustering solution, taking the RWO inventory dimensions as dependent variables and cluster membership as an independent variable. Four separate clusters emerged, each representing a different profile related to students' everyday negative outcomes resulting from a lack of critical thinking. We performed multinomial logistic regression to examine which dimensions of the

HCTA test, as well as gender, age, and disciplinary area, predicted the four singular groups of students that emerged: “Mature,” “Risk-taking,” “Lost in translation,” and “Reflective.” Results indicate that: (1) age is a relevant predictor of slackness, rashness, and health neglect, all characteristics of “Mature” students; (2) students who are particularly skilled in hypothesis testing tend to be “Risk-taking,” while it is less likely that students who are specifically competent in argument analysis will be in this group; (3) gender is relevant to predict “Lost in translation” students, while argument analysis is negatively related to the chances of being in this group. Our study supports the relevance of critical thinking in daily decisions and everyday outcomes.

**Keywords** Critical thinking · Halpern Critical Thinking Assessment · Real-world outcomes · Higher education

## Introduction

In a time when the European Union looks forward to meeting the goals that are part of the so-called knowledge society that characterizes the twenty-first century, which is illustrated with the change in the educational paradigm itself to meet the challenges of today's society—mainly by defending a student-centered approach, the development of skills, and lifelong learning—the policies implemented by the Bologna Process seek to bring about the (informed and qualified) participation of all (European Higher Education Area, 2009). Here, science is one of the main priorities, seeing that it helps to tackle many of the issues that we now face (European Commission, 2014). In this regard, according to the Special Eurobarometer survey report of the *Public Perceptions Of Science, Research And*

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*Innovation* of European citizens in the 28 Member States, there is an impressive percentage of Europeans who believe that it is science and technology, rather than individual action, that has the power to positively impact the majority of the 13 issues under analysis in this report concerning the challenges that European societies will face in the next 15 years. More than individual action, it is science and technology, they believe (at least half of the respondents), that shall contribute the most to address problems concerning “health and medical care” ( $n = 65\%$ ), “education and skills” ( $n = 60\%$ ), “transport and transport infrastructure” ( $n = 59\%$ ), “energy supply” ( $n = 58\%$ ), “protection of the environment” ( $n = 57\%$ ), “fight against climate change” ( $n = 54\%$ ), and “quality of housing” ( $n = 50\%$ ) (European Commission, 2014).

In light of the findings of the Eurobarometer survey report, it could be the case that there is too much reliance on science and its power to solve today’s challenges and that too little depends on individual behavior. Indeed, such data hint at an idealistic conviction that science can solve any problem and, more distressing, that science, rather than people, has the potential to do so. Paradoxically, at the same time, there seems to be a certain disregard concerning science, along with a lack of knowledge concerning the scientific method, and unawareness of the difference between science and pseudoscience (Marçal, 2014). This suggests that there is work to be done. Indeed, in order to accomplish an authentic twenty-first century society of knowledge, as promoted by the European Union’s Bologna Process, it is necessary to bring science and society closer together. This is done, namely, by cultivating individuals to be curious, inquiring, and well-informed about the decisions that are made and that affect their lives. For this reason, it is in order to discuss critical thinking (CT).

### **Critical Thinking: What, Why, and Where**

CT can be defined as a set of skills and dispositions to make a deliberate and methodical use of such skills, for “good” thinking on a daily basis, to increase the chances of success in learning and performance situations (Facione, 2011; Halpern, 2014; Paul, 2005; Watson & Glaser, 2008). A critical thinker has attributes that make her curious, logical, scientific, organized, open-minded, empirical, flexible, epistemically modest, and deliberate. Such dispositions are complemented by skills that make a critical thinker prone to ask questions, analyze arguments and their validity, test hypothesis, elaborate and follow plans of action, dialogue and compromise, search for evidence, consider alternatives, remain open to changing one’s mind and heart, and transfer knowledge from one area to another (Franco & Almeida, 2015).

CT is a very popular transversal skill in academic, professional, social, and personal settings (Abrami et al., 2008). In the academic context, CT is valuable throughout schooling, particularly in higher education, seeing that these students are at the top of their academic education, at a time when they are expected to be participative and self-regulated individuals, who build knowledge in an independent and informed way, and who are preparing to make a significant life transition to the job market (Franco, Almeida, & Saiz, 2014). In the job market, employers seem to consider that the kind of information they need to select an employee is not conveyed by a degree, which is still too attached to memorization, while being too detached from skills such as CT, which now help to (re)define the concept of knowledge and intelligence itself. CT is selected as crucial for success in the workplace, and yet, colleges may be oblivious about what the job market is actually looking for (Benjamin, 2013). In the community, educated and informed citizens “who can think for themselves on the basis of evidence and concomitant analysis, rather than emotion, prejudice, or dogma, is a plus—in fact, it sustains, builds, and perpetuates the democracy” (Abrami et al., 2008, p. 1103). Finally, at an individual level, Butler et al. (2012) found that CT predicts real-world outcomes by assessing participants with the *Halpern Critical Thinking Assessment* (HCTA; Halpern, 2012), a CT assessment test, and the *real-world outcomes* (RWO; Butler, 2012), a self-reported inventory designed to measure everyday actions that are assumed to be mediated by limited CT in view of their negative outcomes. More importantly, students who showed higher scores on the HCTA test accounted for a smaller number of negative outcomes for decisions related to a variety of life events, when compared to students with lower scores (Butler, 2012).

Considering the relevance of CT, which is evident in diverse life moments and life spheres, we examined if CT did show empirical relevance as a variable helping to explain college students’ daily life decisions and outcomes. A few studies show that CT predicts real-world outcomes, with students scoring higher on the HCTA test accounting for a lower score on the RWO inventory (Butler, 2012; Butler et al., 2012; C. P. Dwyer & M. J. Hogan, personal communication, 23 June 2011). Also, Butler (2012) and Butler et al. (2012) suggest that CT (alone) varies according to undergraduates’ number of academic years, with older students, who have more years of education, scoring higher on the HCTA test. In addition, the relationship between CT and disciplinary area is still an unresolved question, with some authors stressing that cognitive skills such as CT vary according to contextual variables, such as pedagogical approach (Brint, Cantwell, & Saxena, 2012; Pascarella, Wang, Trolan, & Blaich,

2013), and for that reason we aimed to elucidate this matter.

With this in mind, our first study goal was to (1) identify different student profiles related to everyday negative outcomes resulting from the lack of CT (assessed by the RWO inventory). Then, we aimed to (2) examine whether CT (assessed by the HCTA test) predicted each student profile, and also, if (3) gender, age, and disciplinary area would be relevant predictors.

## Method

### Participants

We considered a sample of 238 undergraduates from diverse majors (e.g., Biological Sciences; Biomedical Sciences; Communication; Computer Science; Economics; Education; Engineering; Foreign Languages, Literatures and Linguistics; Management; Medicine; Physics; Psychology) enrolled in a public university located in the North of Portugal. The inclusion criteria in our study were being 18 years old or about to turn 18 (two of the participants entered university at 17 years, since they had late birthdays), attending the first year of a Graduate Degree or a Master's Degree, and agreeing to voluntary participation in this study. Participants ranged in age from 17 to 48 ( $M = 21.7$ ,  $SD = 5.49$ ); 81.5% were female. From this sample, 55.9% were 1st year students in a Graduate Degree, and 44.1% were 1st year students in a Master's Degree, in the disciplinary area of Social Sciences and Humanities (SSH) (50.8%), or Science and Technology (ST) (49.2%).

### Measures

(1) *Halpern Critical Thinking Assessment*. The HCTA test presents 25 everyday life scenarios from areas such as education, politics, health, or finances. For each scenario, open-ended and multiple-choice questions are asked, which in combination require elaboration and recognition processes, respectively. Globally, the HCTA test assesses five dimensions of CT: *verbal reasoning* (VR), i.e., recognition of how thought and language influence one another, and identification of persuasive techniques in daily language, in order to avoid being under their influence; *argument analysis* (AA), i.e., analysis of the validity of daily arguments in favor of a certain decision or action; *thinking as hypothesis testing* (THT), i.e., testing hypotheses with an empirical attitude; *likelihood and uncertainty* (LU), i.e., mediation of decisions with probability estimates concerning

success and failure; and finally, *decision-making and problem-solving* (DMPS), i.e., analysis of a problem from different angles, generation of alternatives for action, and selection of the alternative with the greatest chance of success. The HCTA test can be administered for purposes of educational psychology assessment or personnel selection, to individuals aged 18 years and older. Its completion time is around 60–80 min, and its administration and grading are computerized. A higher score on the HCTA test (ranging from 0 to 194 points) reveals a higher level of CT. For our study, we used a Portuguese version of the HCTA test, previously translated, adapted, and validated for Portugal, with an acceptable precision coefficient for CT total score, and replicating the factor structure presented in the original study of the HCTA test with acceptable fit indexes (see Franco, Costa, & Almeida, 2017a).

(2) *Real-world outcomes*. The original RWO inventory is an adaptation of the *Decision Outcomes Inventory* (De Bruin, Parker, & Fischhoff, 2007), designed to assess adults' everyday decisions and behaviors. The original RWO inventory possesses 29 item sets and 11 individual items; each item describes a (negative) outcome that results from a previous decision to take a certain action (Butler, 2012). First, we created a preliminary Portuguese version of the RWO inventory from the translation and cultural adaptation of the original RWO inventory to Portuguese college students, where some items were adapted or eliminated, and others were created (see Franco & Almeida, 2015). This preliminary version of the RWO inventory was composed of 33 items sets and 9 individual items, with a body of 42 dichotomous neutral statements that describe daily life events (e.g., *Gone shopping for food or groceries*), plus sub-items that describe negative outcomes from that specific situation (e.g., *Threw out food or groceries you had bought because they went bad*). Later on, we proposed an original version of the RWO inventory, with fewer items grouped into six dimensions, according to different types of negative outcomes experienced by young adults pursuing a college education: *health neglect* (HN: neglect concerning one's health by lack of information or care); *mismanagement* (M: poor management of time and everyday tasks); *slackness* (S: carelessness regarding one's goods and finances); *poor impulse control* (PIC: harmful behavior to self and/or others); *academic negligence* (AN: negligence concerning one's academic life); and *rashness* (R: imprudent decision-making). This final version showed satisfactory internal consistency (see Franco, Costa,

Butler, & Almeida, 2017b). The final Portuguese version is composed of 21 dichotomous items (Yes/No), divided into the six dimensions listed previously. Similar to both the original version and the preliminary Portuguese version of the RWO inventory, for each statement, the respondent indicates if that situation and its outcome(s) has/have been experienced over the past 6 months. Scores per item range from 0 to 1, depending on whether the respondent did not or did experience (respectively) the daily life event or negative outcome. Overall, more negative outcomes account for a higher total score on the RWO inventory.

## Procedures

Participants were approached through their teachers, who kindly accepted to spare a few minutes of class so we could explain our study goals, ask for students' voluntary participation, and guarantee the principles of informed consent and confidentiality. Those who wished to participate in our study provided their email, so they could be individually contacted to arrange a convenient day/time. The administration of the HCTA test took approximately 1–2 h per participant. Once all protocols were graded, each participant was contacted via email to arrange a suitable day/time to provide their results, as agreed when participants decided to participate in our study. At this meeting, their results were explained and participants were asked to respond to the RWO inventory, which took about 10 min per participant.

## Data analysis

After assuring the normality of our sample's distribution, we performed a cluster analysis (*K*-means-constrained) of all six dimensions of the RWO inventory, in order to detect response patterns that could indicate different profiles of students who shared characteristics within each cluster concerning their real-world life outcomes. Following, we performed ANOVAs for each cluster solution. Finally, we performed multinomial logistic regression, considering the five HCTA dimensions, as well as gender, age, and disciplinary area as predictors. All statistical analyses were considered statistically significant when  $p < .05$  and were conducted using the software IBM SPSS Statistics for Windows (version 22.0).

## Results and Discussion

We applied the *K*-means-constrained clustering method to the composite z-scores of the six dimensions of the RWO inventory (clustering variables: HN, M, S, PIC, AN, and

R). We used z-scores seeing that each RWO dimension is composed of a different number of items (HN, M, and S have three items each, while PIC, AN, and R have four items each). We tested three separate clustering solutions, comprised of two, three, and four clusters each.

To identify the most suitable clustering solution, we performed ANOVAs for each cluster solution, taking the six RWO dimensions as dependent variables and cluster membership as the independent variable. Here, we obtained the general effect size  $\eta^2$  by dividing the sum of all between-groups' sum of squares by the sum of the total sum of groups: for the two-cluster solution,  $\eta^2$  was .275; for the three-cluster solution,  $\eta^2$  was .356; for the four-cluster solution,  $\eta^2$  was .422. In light of the  $\eta^2$  values, we opted to consider the four-cluster solution as the best clustering solution (cf. Table 1).

The analysis resulting from the *K*-means-constrained clustering method showed four separate clusters for each of the six RWO dimensions, with individual clusters within each dimension presenting statistically significant differences between them (cf. Fig. 1).

### Cluster 4: Reflective Group

Taking into account the inverse grading of the RWO inventory (more negative outcomes reported by each respondent account for a higher total score), Cluster 4 seems to represent the "Reflective group," i.e., students who do not tend to experience negative outcomes as a result of a lack of CT in the context of everyday decisions and behavior. This group of students did not report outcomes suggesting that they have made decisions and performed in a way that resulted in neglect concerning their health (HN), mismanagement of time or everyday tasks (M), carelessness regarding goods and finances (S), poor impulse control, leading to potentially harmful behavior to self and others (PIC), academic negligence (AN), or imprudent decision-making (R). In other words, these students tend to make *good* decisions on a daily basis, which results in positive outcomes for themselves. Seeing that an array of individual and contextual variables converge to create a fit adjustment to higher education (Sousa, Lopes, & Ferreira, 2013), such as personality traits, social competence, and academic success (Credé & Niehorster, 2012), it is possible to imply that "Reflective" students are successfully adjusted to life in college.

### Cluster 2: Risk-Taking Group

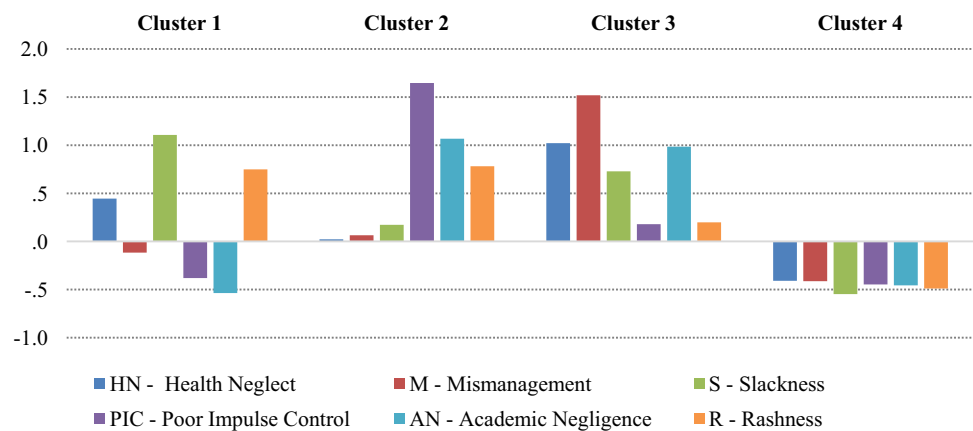
In contrast, Cluster 2 and 3 seem to reflect quite the opposite of Cluster 4, with students reporting negative outcomes in their everyday lives. Nonetheless, each group of students is defined by different types of negative

**Table 1** ANOVAs, means and standard deviations z-scores of the six RWO dimensions by each one of the four clusters

Cluster	HN <i>M (SD)</i>	M <i>M (SD)</i>	S <i>M (SD)</i>	PIC <i>M (SD)</i>	AN <i>M (SD)</i>	R <i>M (SD)</i>	<i>n (%)</i>
1	.4 (.98)	-.1 (.73)	1.1 (1.00)	-.4 (.48)	-.5 (.73)	.7 (1.05)	34 (14.3)
2	.0 (.93)	.1 (.96)	.2 (.87)	1.6 (.78)	1.1 (.78)	.8 (.97)	39 (16.4)
3	1.0 (.91)	1.5 (.89)	.7 (.91)	.2 (.86)	1.0 (.58)	.2 (1.11)	36 (15.1)
4	-.4 (.77)	-.4 (.62)	-.5 (.58)	-.4 (.57)	-.5 (.72)	-.5 (.59)	129 (54.2)
Total	.0 (1.00)	.0 (1.00)	.0 (1.00)	.0 (1.00)	.0 (1.00)	.0 (1.00)	238 (100)
<i>F</i> (3,234)	30.08*	62.79*	57.45*	107.86*	74.77*	36.18*	
$\eta^2$	.278	.446	.424	.580	.489	.317	

\*  $p < .001$

**Fig. 1** Cluster analysis: Mean performance z-scores by the four clusters in the six RWO dimensions (HN, M, S, PIC, AN, and R)



outcomes. On the one hand, Cluster 2 seems to represent the “Risk-taking group,” i.e., students who, given their low ability to control their impulses efficiently, are likely, in some way by the force of circumstances, to incur risky behaviors, such as drinking alcohol to the point of vomiting or not being able to remember parts of the night, smoking cigarettes, or hitting something with their car (all of which are items that compose the PIC dimension of the RWO inventory). Alongside this poor impulse control is intentionally imprudent decision-making, responsible for poor decisions in regard to risky driving behavior (e.g., texting while driving, getting parking tickets, running a stop sign or a traffic light) or risky sexual behavior, such as having intercourse without protection (all of which are items that compose the R dimension of the RWO inventory). Perhaps as a result, concomitantly, these students are also highly negligent in concern to their academic lives, skipping classes or study time for fun, cheating on exams, or being inattentive during class (all of which are items that compose the AN dimension of the RWO inventory). According to the literature, risk behaviors, such as excessive alcohol consumption (Lorant, Nicaise, Soto, & d’Hoore, 2013), or risky sexual activity leading to negative outcomes, such as an unplanned pregnancy (Cooper, 2002), are reported as quite ordinary in college. More worrying, according to a

study of 735 students in health science degree courses, a greater number of students at the end of their courses reported taking part in risky behaviors, such as alcohol consumption, smoking cigarettes, or unprotected sexual activity, when compared to students at the beginning of their courses (da Franca & Colares, 2008). At the same time, there is a close relationship between alcohol consumption and risky sexual activity, which is particularly strong in the context of dating someone new or casual dating (Cooper, 2002). Indeed, the transitional time that defines college entry, a time when young people are being exposed to singular life challenges and experiences that make them expand their identity, and where they are expected to become independent, responsible adults who can manage their own life trajectories, is accompanied by risky behaviors. And yet, such risky behaviors (combined or individually) performed by students may represent a serious threat to their well-being and adjustment. Above all, because risk seems to take many forms, they together create a composite menace; for instance, Lorant et al. (2013) found a strong association between exposure to college environmental variables (such as living on campus, away from home, with a large number of roommates) and a higher risk of excessive alcohol consumption. Moreover, this association proved to be stronger under the influence of

social involvement with a set of social activities (such as active participation in student folklore groups), and compliance with expectations concerning alcohol consumption. In light of these findings, it is possible that the “Risk-taking” group is comprised of those undergraduates who are mainly attracted to the social interactions and new experiences that usually come along with college entry, hence disregarding their academic responsibilities.

### Cluster 3: “Lost in translation” Group

On the other hand, Cluster 3 seems to represent the “Lost in translation group,” i.e., students who are, perhaps, experiencing difficulties in the transition/adjustment process to higher education, seeing that this is a novel and challenging new phase, a true turning point in their lives. Such a transition implies parting with home and family, even leaving one’s city or district, which means students lose their social support networks (Sousa et al., 2013). This is noteworthy, in that this variable is strongly related to a positive adjustment to college (Credé & Niehorster, 2012; Rahat & İlhan, 2016). For instance, loneliness was found to have a direct negative impact on college adjustment, and also, to trigger a negative coping style, while repressing a positive one, which in turn had a further negative impact on college adjustment (Quan, Zhen, Yao, & Zhou, 2014). At the same time, the level of difficulty, autonomy, and participation in college is higher, and these students may not have yet managed to feel integrated into their new lives, not being able to keep up with the requirements of college, and the demands and challenges of life away from home as independent, responsible adults. According to our data, students in Cluster 3 are strongly characterized by negative outcomes resulting from poor management of time and everyday tasks, to the point of it disturbing their academic lives, such as spending too much time watching television and those sorts of habits affecting their college career, continually arriving late to class, or forgetting to do a class assignment (all of which are items that compose the M dimension of the RWO inventory). In fact, the literature shows that academic failure is partly related to the lack of study habits and to being unprepared to manage time and academic activities (Monteiro, Almeida, Vasconcelos, & Cruz, 2014). Also, such difficulties in the transition or adjustment to college, illustrated with the troubles managing time and tasks efficiently, is also evident in a high level of disregard concerning their health; in the midst of all the hustle and bustle of their new lives as undergraduates, students find themselves frequently eating too much or eating unhealthy food, or not caring (or not knowing how) to protect themselves properly (all of these are items that compose the HN dimension of the RWO inventory). At the same time, yet less strongly, these

students are rather careless with their goods and finances, reporting to the purchase of clothes or shoes that are never worn, throwing out food because they let it expire, and having to return a book to the library without reading it at all (all of which are items that compose the S dimension of the RWO inventory). It could be the case that this group of students is experiencing a hard time adapting to the new demands of a higher level of education, where old ways of studying, interacting, and living are no longer fit for new, complex, and challenging demands (Credé & Niehorster, 2012). Certainly, college entry is an intricate transition process that demands new academic strategies, new ways of relating to others (Sousa et al., 2013), and a new attitude toward daily affairs (Quan et al., 2014; Rahat & İlhan, 2016), in order to adjust successfully to college. Indeed, the mean age of our participants is 22 years, and students are all enrolled in their first year (of either a Degree or a Master’s Degree), which entails a new academic start at a new academic level, very often in a new city. If their sense of academic comfort is lost and their emotional stability is disturbed, the likelihood is that students will hardly develop a sense of academic integration and feel motivated about learning (Almeida, Guisande, & Paisana, 2012), seeing that difficulties resulting from the demands of higher education, relationships, and context may hinder efficient adjustment to college and hence negatively affect students’ academic performance (Quan et al., 2014; Sousa et al., 2013). This may help to explain why these students also show a high level of academic negligence, and yet, academic negligence is not such a pronounced characteristic as mismanagement (M). As a result of poor management of time and everyday tasks, these students may be struggling to keep up with their classes, tasks, activities, and many other demands of college, which may consume too much energy from them, making them feel frustrated and lost and, therefore, less motivated toward academic life.

### Cluster 1: Mature group

Finally, Cluster 1 represents the “Mature group,” i.e., students who are mostly characterized for neglecting their goods and finances (S), and for being reckless when making decisions, which results in risky behavior (R). Also, yet less expressively, these students have a tendency to overlook matters concerning their health (HN). Two positive characteristics that describe these students is that they are less prone to being negligent about their academic life (AN) and less likely to undertake behavior that could be dangerous to themselves and/or others (PIC). It could be the case that these are mature students, the so-called non-traditional students, who now access higher education at an older age than the average undergraduate, who starts

college around 18 years old. Currently, older adult students, many with a family already, access college after having delayed their college entry for some reason and having worked in the job market for a rather long period of their lives. These students access college for a multiplicity of reasons: to resume their academic education for self-realization; to build knowledge in a certain field and develop new competences; to obtain a certification that illustrates the knowledge they gained throughout their career and life; or even to improve their career opportunities and progression by expanding their academic education (Gonçalves, 2014). Many of them are part-time students, who attend college after working hours (Rose et al., 2013), which could mean about 4 h of class starting at 6 p.m., in addition to all the work involved outside class time after a day's work. Hence, it is easy to understand why they are highly motivated and less likely to neglect their academic life (Gonçalves, 2014; Rose et al., 2013). At the same time, it is simple to see why these students neglect their health by eating too much food and/or unhealthy food too often, for example, since they must juggle work, college, and family (Rose et al., 2013), and time is scarce for them. Also, being older, these students are less likely to suffer from poor impulse control, given their stronger maturity and highly developed sense of self. At the same time, being financially independent, it is plausible that these students can afford to have a car, hence, to drive and make imprudent decisions concerning driving behavior, and to overlook expenses that a student who does not receive an income besides her/his parents' allowance could not afford to overlook, such as buying new clothes or shoes (and never getting around to wear them), or throwing out food/groceries.

Having opted for the four-cluster solution as the best clustering solution, with each cluster representing a different student profile regarding the type of negative outcomes resulting from the lack of CT when making decisions and acting, we performed multinomial logistic regression. This model is used to predict the probabilities of the different possible outcomes of a dependent variable, given one or more independent variables (Schwab, 2002). Our goal was to analyze if CT predicted real-world outcomes by examining which dimensions of the HCTA test predicted the four singular groups of students that emerged from our data. The model is significant:  $\chi^2$  (24,  $n = 238$ ) = 54.7,  $p < .001$  and the Nagelkerke pseudo  $R^2 = .226$ . Also, our aim was to analyze whether this relationship varied according to sociodemographic and academic characteristics. Here, we considered the four groups of students that emerged from the cluster analysis of the RWO inventory as our dependent variable, and the following variables as predictors: all five dimensions of the HCTA test (VR, AA, THT, LU, and DMPS), gender, age,

and disciplinary area. The complete model significantly predicts our dependent variable and does so better than the model with no variables added (intercept-only) alone,  $p < .001$ ; according to our data, gender (OR =  $p = .05$ ), age (OR = .00), and two HCTA dimensions, AA ( $p = .06$ ) and THT ( $p = .02$ ).

Taking Cluster 4 (the “Reflective” group) as our reference category, since it is composed of those individuals who seem to be living an appropriate and regular college experience, there are statistically significant coefficients for all three sets of coefficients: Cluster 1 (“Mature”), Cluster 2 (“Risk-taking”), and Cluster 3 (“Lost in translation”) (cf. Table 2).

In light of the multinomial logistic regression analysis, we identified the characteristics that differentiate the four clusters and that help to describe four different student profiles.

### Age Predicts Slackness, Rashness, and Health Neglect (Cluster 1)

According to our data, age is relevant to distinguish Cluster 1 (“Mature”) from Cluster 4 (our reference group). The older the student, more likely she is to neglect personal goods and finances (S), to make reckless decisions (R), while not showing poor impulse control (PIC), or disregarding health (HN). At the same time, such characteristics do not seem to cause these students to be negligent concerning their academic life (AN). This supports our previous hypothesis that this group would concern mature students, very likely non-traditional students, who enter college at a later time, and who may juggle college with a (part-time) job, as well as family. In sum, it is more likely that older students (rather than younger students, who access college on average at the age of 18) are in the “Mature” group, rather than in any of the other groups.

### Thinking as Hypothesis Testing and Argument Analysis Predict Risk-Taking (Cluster 2)

Age also seems to be relevant to differentiate Cluster 2 (“Risk-taking”) from our reference group (Cluster 4), even if with marginal significance. On the contrary, two dimensions of the HCTA test, THT and AA, are strongly related to risk-taking students, even if in opposite directions. On the one hand, students who are particularly competent in posing and testing hypotheses, while keeping an empirical attitude in face of everyday decisions, will tend to be risk-taking students, who are somehow not apt to control their impulses yet (PIC), and end up conducting themselves dangerously and making imprudent decisions with potentially hazardous outcomes (R). At the same time, academic life is neglected (AN), perhaps because these

**Table 2** Multinomial logistic regression for cluster membership

Clusters	Independent variables	<i>B</i>	SE	Wald	<i>p</i>	OR	OR 95% CI	
							Lower bound	Upper bound
Cluster 1: Mature	Gender	.413	.596	.480	.488	1.512	.470	4.865
	Age	.109	.035	9.518	.002	1.116	1.041	1.196
	Scientific area	.039	.460	.007	.932	1.040	.423	2.560
	VR	−.102	.074	1.898	.168	.903	.781	1.044
	AA	−.043	.056	.600	.439	.957	.858	1.069
	THT	.001	.058	.000	.991	1.001	.893	1.121
	LU	−.038	.082	.215	.643	.963	.820	1.130
	DMPS	.022	.048	.223	.637	1.023	.932	1.122
Cluster 2: Risk-taking	Gender	.390	.511	.581	.446	1.477	.542	4.023
	Age	.072	.038	3.561	.059	1.074	.997	1.157
	Scientific area	−.577	.450	1.642	.200	.562	.232	1.357
	VR	−.013	.070	.032	.858	.988	.860	1.134
	AA	−.124	.055	4.987	.026	.884	.793	.985
	THT	.172	.058	8.907	.003	1.187	1.061	1.329
	LU	.112	.085	1.741	.187	1.119	.947	1.322
	DMPS	−.006	.047	.016	.899	.994	.906	1.091
Cluster 3: Lost in translation	Gender	1.412	.496	8.115	.004	4.105	1.554	10.848
	Age	−.019	.048	.159	.690	.981	.893	1.078
	Scientific area	−.004	.444	.000	.993	.996	.417	2.380
	VR	.036	.070	.260	.610	1.036	.903	1.189
	AA	−.110	.055	3.974	.046	.896	.804	.998
	THT	.067	.056	1.419	.233	1.070	.958	1.195
	LU	−.051	.079	.408	.523	.951	.814	1.110
	DMPS	−.001	.045	.000	.984	.999	.915	1.091

\* The reference category is Cluster 4: Reflective

undergraduates' main interests when they enter college are socializing and living new experiences. It is possible that, of all five CT dimensions assessed by the HCTA test, the THT feature entails being particularly curious and open to the world, receptive to new experiences, even if those experiences involve some level of risk. It is very likely that these students have particular personality traits, such as extroversion or openness to experience, that are associated with our results. On the other hand, students with high scores in the AA dimension should not be expected to be in the "Risk-taking" group, given the negative correlation. It could be the case that students who tend to be very analytical and methodical when thinking, who decide and act on the grounds of prior careful thinking, will not practice hasty, careless reasoning leading to harmful behavior, such as the "Risk-taking" group does. In sum, it is more likely that students who are particularly skilled in testing hypotheses (rather than any of the other four CT features that we assessed) fall into the "Risk-taking" group, rather than in any of the other groups. Conversely, it is less likely

that students who are specifically competent in analyzing arguments (rather than any of the remaining CT features) will be in the "Risk-taking" group.

### Gender Predicts Being "Lost in translation" (Cluster 3)

In light of our data, gender appears to be relevant in distinguishing Cluster 3 ("Lost in translation") from Cluster 4 (reference group). Since males are coded as 1, we can conclude that the odds of males belonging to Cluster 3 is 4.105 times greater than females (when compared to Cluster 4). In other words, it is male students who seem to be experiencing more difficulty in the transition to college, not yet adjusted to their new lives as independent adults nor to the novel requirements that a college education demands. It is male students who have more negative outcomes on a daily basis related to mismanagement of time and everyday tasks (M), to neglecting their health (HN), and to acting in a careless way concerning goods and



finances (S). Perhaps as a result, academic life seems to be somehow neglected (AN). Another interesting finding here is that the AA dimension is negatively related to the likelihood of being in the “Lost in translation” group of students. Analytical students do not act thoughtlessly, but after careful consideration of the arguments that are provided; it is possible that such steadiness and deliberate reasoning work as protective factors against the new circumstances and demands that make other students feel as though they are “lost in translation” after they enter college. In sum, it is more likely that men will be in the “Lost in translation” group, rather than in any of the other three groups. In contrast, it is less likely that students who are very capable of analyzing arguments (rather than any of the other CT features) will be “Lost in translation.”

Taking into account the pseudo  $R^2$ , the proportion of variance explained by our model is 20.5%. Hence, there are other variables explaining the remaining variability differentiating students in each one of the four groups.

## Conclusion

The “knowledge society” defended by the Bologna Process implies that all individuals are informed, inquiring, proactive, and participating. And yet, individuals may be oblivious to such requisites, still reconciled with a role that is too uninformed, too unaware, passive, and oriented to being a bystander. Such an attitude consigns the power of thought and action to external sources, such as science, as suggested in the 2014 European Commission’s Special Eurobarometer survey Report mentioned earlier, and for that reason it must be opposed.

One way to promote understanding, curiosity, deliberateness, and participation is via CT, which is indicated as particularly necessary in one’s personal, professional, academic, and social life. But does CT, indeed, have an impact on people’s lives?

In the present study, our aim was (1) to identify different student profiles related to their everyday negative outcomes resulting from the lack of CT, and (2) to examine whether CT predicted each student profile, as well as (3) gender, age, and disciplinary area. In light of our results, there are four singular profiles of students in regard to the type of everyday negative outcomes: “Mature,” “Risk-taking,” “Lost in translation,” and “Reflective.” Here, the THT and the AA dimensions of CT are relevant to predicting which students will or will not be “Risk-taking,” as well as which students will tend to feel “Lost in translation” or not. Moreover, gender and age are significant predictors for identifying “Mature” and “Lost in translation” students, respectively.

CT, defined as the skill and will to reason, to make sound decisions, to create solutions, and to solve problems, helps to predict how students perform in the face of daily situations and the outcomes they bring upon themselves.

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