





Reading Fluency of Higher Education Students

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Abstract: The literature that links career development with reading skills is scarce. This study seeks to fill this gap, for which the reading fluency of college students was analyzed, taking into account the choice of more/less desirable courses. Desirability is based on the classifications for college access. 211 students participated in the study, 132 female, attending four courses: Mechanical Engineering, Health, Psychology, and Education, in three Portuguese Public Universities. The instruments used were the sociodemographic form and the Teste de Idade de Leitura (Reading Age Test – TIL). The results indicated that students attending less desirable courses (i.e., Education and Health) are significantly less fluent and; students who score lower on reading fluency are more likely to belong to the Education course. This study stresses the importance of the distribution of students by the different areas of studies should not reflect reading fluency asymmetries.

Keywords: college students, reading, fluency, occupational choice

Fluência Leitora de Estudantes do Ensino Superior

Resumo: A literatura que articula o desenvolvimento de carreira com a leitura é escassa. Este estudo teve como objetivo analisar a fluência leitora de estudantes universitários, considerando a escolha de cursos mais/menos desejados. A desejabilidade tem por base as classificações de acesso ao Ensino Superior. Participaram 211 estudantes, 132 de sexo feminino, a frequentar quatro cursos: Engenharia Mecânica, Saúde, Psicologia e Educação, em três instituições públicas de ensino superior portuguesas. Os instrumentos utilizados foram ficha sociodemográfica e Teste da Idade de Leitura - TIL. Os resultados indicaram que estudantes de cursos menos desejados (i.e., Educação e Saúde) são significativamente menos fluentes e; estudantes com menor fluência leitora são mais prováveis de pertencerem à Educação. Este estudo destaca a importância da distribuição pelas diferentes áreas de estudo não ser um espelho de assimetrias ao nível de competências leitoras.

Palavras-chave: estudantes universitários, leitura, fluência, escolha profissional

Fluidez Lectora de Estudiantes de Educación Superior

Resumen: La literatura que vincula desarrollo profesional con habilidades lectoras es escasa. Este estudio busca llenar este vacío, analizando la fluidez lectora de estudiantes universitarios en cursos más/menos deseables. La deseabilidad de los cursos se basa en las clasificaciones de acceso a la Universidad. Participaron 211 estudiantes, 132 mujeres, de cuatro cursos: Ingeniería Mecánica, Salud, Psicología y Educación, en tres universidades públicas portuguesas. Los instrumentos utilizados fueron la ficha sociodemográfica y el Test de Edad Lectora - TIL. Los resultados indican que los estudiantes de cursos menos deseables (Educación y Salud) son significativamente menos fluentes y; estudiantes con puntuación más baja en fluidez tienen más probabilidades de pertenecer al curso de Educación. Este estudio destaca la importancia de que la distribución por las diferentes áreas de estudio en la universidad no sea un espejo de asimetrías en el nivel de habilidades lectoras.

Palabras clave: estudiantes universitarios, lectura, fluencia, escogimiento profesional

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Support: This work was supported by European Horizon 2020, under Operação Norte-08-5266-FSE349 000095.

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In modern societies, proficient reading is an essential skill. However, about 15% of children experience difficulties in learning to read and write in grade 1 (American Psychiatric Association, 2013), difficulties that can compromise proficient reading in the future. In Portugal, around 10% of children in the 2nd year of schooling are subject to the academic

retention measure, the most serious measure to compensate for learning difficulties. These are problematic data, since as children begin to be aware of their difficulties, they tend to avoid tasks that involve precisely this knowledge, with consequences in terms of motivation in relation to school and school learning in general (Raspin, Smallwood, Hatfield, & Boesley, 2019). This aspect is even more important when we know that the acquisition of knowledge in other areas of the curriculum presupposes reading domain (McGrath & Hughes, 2018), and that, if nothing is done, these difficulties often persist into adulthood (Wilson et al., 2015). On the other hand, when difficulties are identified early and are the target of a systematic, intensive, individualized or small group intervention, the probability of reversing the trajectories of failure that lead to the impairment of the school trajectory is very high (Hall & Burns, 2018).

A recent study revealed that around 20% of young people attending public higher education courses in Portugal have weak reading skills (Sucena et al., 2017), in areas as diverse as Engineering, Education, Health and Psychology. This result reflects the maintenance, in the time interval between the 1st cycle and Higher Education, of the percentage of individuals with weak reading skills.

Success in learning to read is closely related to good performance in the educational, social and professional path (Jamshidifarsani, Garbaya, Lim, Blazevic, & Ritchie, 2019). In turn, good academic performance is associated with better reading fluency skills (Ghani, Muslim, & Zakaria, 2020), high academic aspirations, school involvement, a deep approach to learning, orientation towards learning goals and positive academic self-concept (Creed, Tilbury, Buys, & Crawford, 2011; Taveira, Azevedo, & Oliveira, 2017). Students with low academic performance tend to exhibit poorer reading fluency skills (Ghani et al., 2020), thus being at risk. Students who have experiences of school failure and do not improve results despite their effort, may develop stable and uncontrollable internal attributions (e.g., ability), due to low results (Oliveira & Taveira, 2016). Such attributions tend to sustain low academic self-esteem, expectations of future failure, and orientation to avoid schoolwork (Creed et al., 2011), in turn associated with low academic aspirations, behavior problems at school, and low expectations of academic self-efficacy. Projecting into a more distant future, these factors are often associated with low life satisfaction and the restriction of academic and career alternatives, based on perceptions of low competence, with an increased probability of future unemployment (Aro et al., 2018), low social status (Creed et al., 2011), difficulties in obtaining higher education degrees or achieving high levels of income (Hakkarainen, Holopainen, & Savolainen, 2015). Finally, individuals with learning difficulties are more likely to experience mental health disorders (e.g., depression, anxiety) than individuals without learning disabilities (Aro et al., 2018). In a nutshell, any impairment of reading ability is, directly or indirectly, a limiter of career aspirations (Jamshidifarsani et al., 2019).

It is essential to create the conditions for children and young people to overcome the difficulties of learning to read,

so that they are not limited to a restricted range of academic and professional alternatives. In Portugal, although with successive amendments, the current legal framework for access to Higher Education dates from 1998. A *numerus clausus* policy is followed, which limits the number of students in the most requested (that is, most desirable) areas of study, regulating the offer of higher education in relation to demand and scientific priorities (Direção Geral do Ensino Superior [DGES], 2020). This practice is common in other European countries (e.g., Germany, Finland) (Kosunen, 2018), but different from the practices followed, for example, by the United States of America (Hanson, Perez-Felkner, & Thayer, 2020). The search for the most requested areas is often based on the associated prestige, and is influenced, among other factors, by the education of parents (Dietrich, Kracke, & Nurmi, 2011). Young people whose father/mother has attended/completed Higher Education tend to choose courses associated with greater prestige (Borges & Carnielli, 2005). Courses with more prestige are, in turn, the most desirable (e.g., engineering) and are associated with higher access ratings.

An analysis of the evolution of the application classifications of the last place in the 1st phase in the scientific areas of the courses considered in this study, specifically Mechanical Engineering (Universidade do Porto), Health (Instituto Politécnico do Porto), Psychology and Education (Universidade do Minho), between 2008/09 and 2020/21, indicates that Education is the course with the lowest application rating (DGES, 2020; Sucena, Carneiro, Almeida, & Viana, 2017). The application grades in Education rose between 2008 and 2010, between 2010 and 2015 they gradually went down and between 2015 and 2019 the trend was up again, going down again between 2019 and 2020. Mechanical Engineering, on the other hand, tends to be the course with the highest application grade. Between 2008 and 2020, the application grades for Mechanical Engineering were the only ones that kept growing (with only a slight decrease between 2012 and 2013). The entrance grade in the Psychology course had a slight evolution between 2008/2009 and 2011/2012, but later stabilized, rising again from 2018 to 2020. The Health courses - Cardiopneumology and Radiology - had a drop in the application score until 2015/2016, when they underwent a restructuring (renaming themselves Clinical Physiology and Medical Imaging and Radiotherapy, respectively) and rose slightly in recent years (Figure 1) (DGES, 2020; Sucena et al., 2017).

Information is scarce regarding the relationship between higher education access ratings and reading fluency. However, the correlation between academic performance (which, in turn, is directly reflected in higher education access ratings) and reading skills is clear and has been studied for a long time (Silva & Santos, 2004). In the study by Silva and Santos (2004) it was found that better grades in Portuguese in the 12th grade are associated with better reading comprehension. The higher the level of education, the better the levels of reading fluency and accuracy (Pacheco & Santos, 2017) and, in turn, the better the reading fluency, the better the level of comprehension (Martins & Capellini, 2019). It is important,

however, to point out that the relationship between fluency and reading comprehension is not direct. Reading fluency is a multidimensional and measurable construct (Kim, Quinn, & Petscher, 2021). Several countries (e.g., Portugal, France, United Kingdom) have defined minimum levels of fluency, using as a measure the number of words correctly read per minute (considered necessary for the extraction of meaning) in the different years of schooling (Buescu, Rocha, & Magalhães, 2021). Reading fluency is characterized by the ability to read texts with precision, speed and prosody (Kim et al., 2021). Thus, reading fluency acts as a mediator of the relationship between decoding, listening comprehension and reading comprehension (Kim et al., 2021). In other words, although reading fluency strongly contributes to good reading comprehension, good comprehension is not guaranteed only by good reading fluency (Kim et al., 2021).

In short, the literature that articulates the selection of the Higher Education course and the variables involved in

academic performance is still scarce. This study aimed to analyze the reading fluency of college students, considering the choice of most/less desirable courses. Specifically, the reading fluency of students from the Engineering, Health, Psychology and Education courses, considering the choice of most/less desirable courses (measured according to the classification of access to Higher Education of the last place in the 1st phase). It was considered that classifications of access to Higher Education of the last place in the 1st phase equal to or above 17 values correspond to the most desirable courses (Mechanical Engineering); equal to or greater than 14 values (and less than 17) very desirable (Psychology); and ratings equal to or greater than 10 (and less than 14) less desirable (Education and Health). We expected that students with worse access scores would have worse levels of reading fluency and, at the same time, that reading fluency results in the less desirable courses would be lower than in the most desirable courses.

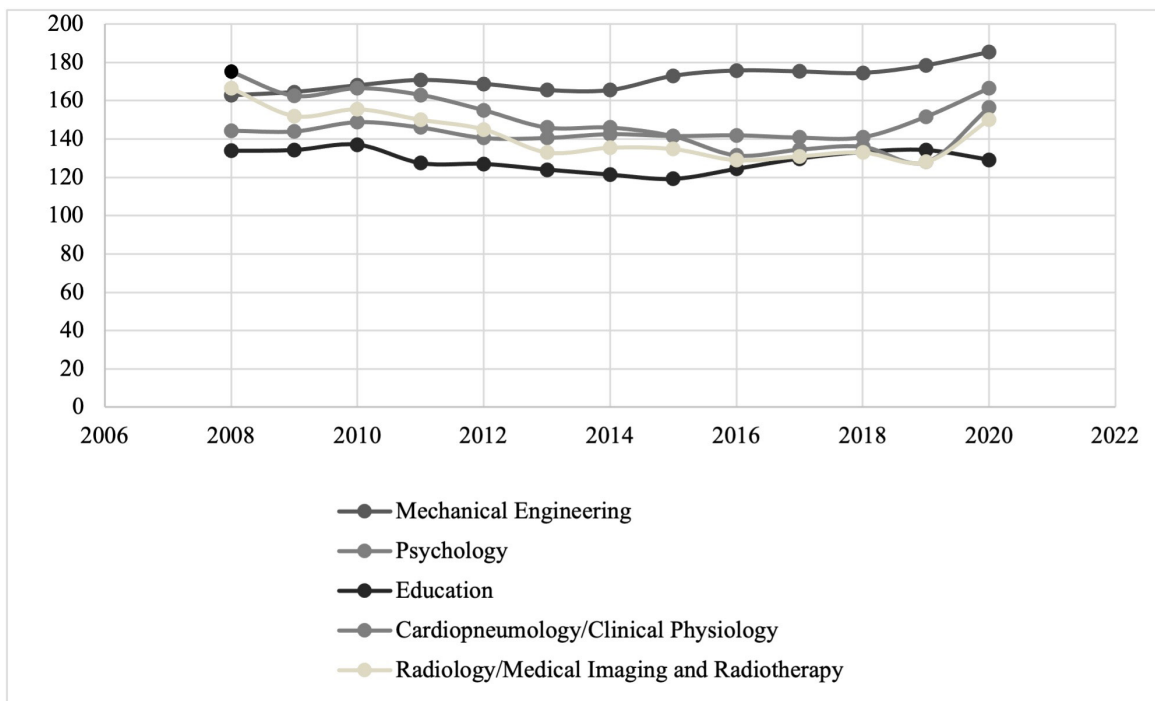


Figure 1. Evolution of application grades in the different scientific areas between 2008/09 and 2020/2021.

Method

Participants

211 college students participated in this study, 132 female (62.6%) and 79 male (37.4%), attending the 1st year of the following four courses: Mechanical Engineering ($n = 54$), Health ($n = 52$), Psychology ($n = 50$), and Education ($n = 55$), in two Portuguese Public Universities, and a Polytechnic Institute. All students were evaluated at the beginning of the 2nd semester of the 2020/2021 academic year.

Instruments

Participants were characterized based on age, sex, Higher Education Institution (HEI) and course, using a sociodemographic form. They were also evaluated for reading fluency using the *Teste de Idade de Leitura* (Reading Age Test - TIL) (Sucena & Castro, 2010). The TIL has good psychometric properties with college students, showing good indicators of internal consistency $\alpha > .78$ (Fernandes, Araújo, Sucena, Reis, & Castro, 2017). This test implies basic comprehension skills and accurate and fluent decoding.

Specifically, it is a test that evaluates one of the components of fluency: reading speed. The test is based on 36 incomplete sentences (with the last word missing). The task consists of completing each sentence, selecting the correct option among five alternatives. Among each set of five words, four are distractors. Each distractor is of a different type: no similarity to the target word, one phonological, with visual or semantic similarity, pseudo randomly positioned in the set of alternatives (e.g., all dogs have four...: Mouths, Paws, Tweezers, Pears, Ears). The task is to complete as many sentences as possible, without time constraints. Once the test was completed, the time spent was indicated (reading speed). In this study, we analyzed the performance of college students in this reading fluency test through the time that each participant needed to finish the test, completing the maximum number of sentences (reading speed). Following the theoretical assumption that the lower the reading speed (i.e., the longer it takes to complete the test), it is understood that the worse the reading fluency levels are (Kim et al., 2021).

Procedures

Data collection. The sample selection procedure was one of convenience. This is a non-probabilistic sample. Data were collected in the context of the classroom, after the invitation to participate voluntarily. The filling instructions were always the same, mentioned aloud. The instruments were always administered in the same order. Each participant was asked to indicate the time it took to complete the test. The completion of the assessment instruments never exceeded 15 minutes.

Data analysis. Statistical analyzes were performed using the *Statistical Package for the Social Sciences* (SPSS IBM) for *Windows* version 25.0. A Unifactorial ANOVA was performed to test the effect of the course on reading skills (reading fluency). Previously, the assumptions of normality of the distribution of the dependent variable by the groups defined by the two independent and homogeneity variables were analyzed (through the Levene's Test). The normality assumption is not fulfilled. The assumption of homogeneity is fulfilled (Levene's Test =.64). Given the non-compliance with all assumptions, non-parametric difference tests

were performed. As the results of the parametric and non-parametric tests go in the same direction as the rejection of the null hypothesis, the results of the parametric tests are reported (Martins, 2011).

A Multinomial Logistic Regression was also carried out to test the predictive role of reading fluency in the choice of Higher Education course. The following assumptions were previously analyzed: the size of the sample; the dependent variable is nominal; independence of observations; absence of outliers; coding of variables (Engineering course was considered the reference group because it was the group with the best reading fluency levels) (Osborne, 2015).

Ethical Considerations

Authorizations were obtained from Higher Education Institutions (IES) – Universidade do Porto, Universidade do Minho and Instituto Politécnico do Porto, and from the students involved. The objectives of the evaluation were presented to the participants and confidentiality in the treatment of data was guaranteed. All ethical standards recommended for this type of studies were complied with (e.g., informed consent, privacy and confidentiality) (Regulation No. 258/2011 Code of Ethics of the Ordem dos Psicólogos Portugueses). The approval of the Ethics Committee was not required, according to local legislation and institutional requirements, since it was still under construction at the time of the study.

Results

Observing Table 1, we can see that Psychology students are those whose reading fluency is greater, that is, they need less time to complete the TIL, followed by Mechanical Engineering, Health and finally Education students. Education students need on average about 33 seconds more than Psychology students.

The results of the Unifactorial ANOVA show that there are statistically significant differences between students of Mechanical Engineering, Health, Psychology and Education in terms of reading fluency, $F(3.207) = 6.31, p < .001$ (Table 1).

Table 1

Reading skills (fluency) in college students of Mechanical Engineering, Health, Psychology and Education

	Course				$F(3.207)$
	Engineering ($n = 54$) Mean (DP)	Health ($n = 52$) Mean (DP)	Psychology ($n = 50$) Mean (DP)	Education ($n = 55$) Mean (DP)	
Reading fluency	197.80 (41.74)	201.02 (36.43)	188.80 (40.53)	222.02 (42.39)	6.31***

Note: *** $p < .001$; Reading fluency measured in seconds.

Gabriel's Post-Hoc tests reveal that students from the Education course have significantly longer reading speed times (i.e., worse levels of reading fluency) than students from Mechanical Engineering, Health or Psychology (Table 3). There are no statistically significant differences between Engineering and Psychology students, nor between Health and Psychology students.

The results of the Unifactorial ANOVA to assess the reading fluency of students from the most and less

desirable courses reveal that there are statistically significant differences, $F(2,208) = 5.77, p = .004$ (Table 2).

Thus, Gabriel's Post-Hoc reveals that students from less desirable courses (Education and Health) have longer reading times, that is, worse fluency, compared to students from very desirable courses (Psychology) (Table 3). As already mentioned, in terms of the analysis of reading fluency by course, Education stands out, with reading fluency results significantly worse than any of the other courses.

Table 2
Reading skills in students of less, very and most desirable courses

	Course			<i>F</i> (2.208)
	Less desirable (<i>n</i> = 107) Mean (<i>DP</i>)	Very desirable (<i>n</i> = 50) Mean (<i>DP</i>)	Most desirable (<i>n</i> = 54) Mean (<i>DP</i>)	
Reading fluency	211.81 (41.74)	188.80 (40.53)	197.80 (41.74)	5.77**

Note: ** $p < .01$; Reading fluency measured in seconds.

Table 3
Gabriel's Post-Hoc Tests

	Gabriel's Post-Hoc Tests								
	Less desirable vs. Very desirable	Less desirable vs. Most desirable	Very desirable vs. Most desirable	Engineering vs. Health	Engineering vs. Psychology	Engineering vs. Education	Health vs. Psychology	Health vs. Education	Psychology vs. Education
Reading fluency	**	n.s.	n.s.	n.s.	n.s.	**	n.s.	*	***

Note: *** $p < .001$; ** $p < .01$; * $p < .05$.

The results of the Multinomial Logistic Regression Analysis reveal that the final model (with all courses) brings a significant improvement in the fit compared to the null model ($\chi^2(3) = 18.06, p < .001$), allowing to correctly classify 36% of cases. The chi-square test, as well as the chi-square deviation, indicate that the model fits the data well ($\chi^2(339) = 328.72, p = .65$; $\chi^2(339) = 336.17, p = .53$). The univariate results indicate that the type of course, specifically Education, is the only significant predictor of the model ($\beta = .014, Wald = 8.39, p = .004$), explaining 66% of cases. Therefore, when we analyze students who score lower in reading fluency, we are more likely to find students who attend the Education course.

Discussion

The present study aimed to analyze the reading fluency of college students, considering the choice of most/less desirable courses. The results revealed statistically significant differences between students from different courses.

Specifically, Education students had worse levels of reading fluency than Psychology, Engineering or Health students. These results confirm the trend reported in a previous study that compared the reading fluency of Engineering and Education students (Sucena et al., 2017), verifying that Education students showed worse reading fluency, although the difference, in this study, was not statistically significant.

It should also be noted that the students of the Education course have the lowest access rating among the Courses analyzed in this study (DGES, 2020). These results support the hypothesis of the existence of a relationship between worse classifications of access to Higher Education and worse levels of reading fluency. The results presented in this study are in line with the literature, still scarce, which emphasizes that students with low academic performance (including low grades in Portuguese) tend to exhibit poorer reading fluency skills (Ghani et al., 2020). In this way, it seems important to us to implement programs that help to promote early reading skills, so that lower access ratings to Higher Education do not reflect lower levels of reading fluency.

In the same sense, when we analyze the classifications of access to courses according to their level of desirability, it would be expected that students from less desirable courses (Education and Health) would present worse levels of reading fluency than those exhibited by students from very or most desirable courses (Engineering, Psychology). This hypothesis is partially confirmed. If at the level of the most desirable courses - Engineering and Psychology - the fluency is actually higher than in the less desirable course - Education -, the analysis of the results of the students of the Health courses - also a less desirable course - does not correspond to the profile of worst reading fluency. Effectively, Education and Health were categorized as less desirable – based on the same criteria of access ratings below 14 values. However, Education students read significantly slower than the rest, including Health. Regarding the significant difference between the less (Education and Health) and very desirable (Psychology) courses, but not between the less (Education and Health) and most desirable (Engineering) courses, this apparent discrepancy is due to the slight advantage (on average of 9 seconds) of reading speed of Psychology students compared to Engineering students.

The results of this study reveal that we found, massively, in the same course (Education) students with lower reading fluency. Precisely a course (and its future career path) that depends on people who are strongly interested in reading, since these professionals will be the ones who will teach children to read.

Regression analysis also supports that, more likely, students who have weaker levels of reading fluency are students of the Education course. Along with these results, it is worth noting the absence of differences in reading fluency between Psychology and Engineering students. These results suggest that, once a good level of reading fluency is reached, reading fluency competence ceases to function as an influencing factor in course selection. It is important to point out, however, that the model explains only 36% of the cases, so it is important to analyze, in future studies, other variables that contribute to explain this relationship between reading fluency and the choice of Higher Education (e.g., interests, values).

It seems worrying to us that: (i) the choice of Higher Education course is limited by the access classification; and (ii) a degree with the social importance of the Education course, which graduates those who will be responsible for the education foundation of future generations, has such a high proportion of young people who reveal weaknesses in terms of reading fluency. This weakness is further confirmed by the fact that the participants in this study scored below the normative data ($M = 15.5$ items in 60 seconds) (Fernandes et al., 2017). In this sense, and as previously proposed, it is crucial to bet on reading in early stages (Hall & Burns, 2018). Also, we especially need teachers (graduated, with regard to EPE and 1st, 2nd and 3rd cycles, in Education courses) who are motivated, committed and capable, since these professionals will work on the foundation of reading skills with the children. This aspect is, as a rule, more easily achieved when the choice of course occurs

as a result of knowledge of oneself and the environment, as well as the commitment to the choice of career, and not by restriction of academic and career alternatives (Aro et al., 2018).

The authors of the present study defend a student selection process, instead of the ranking process that has been used. It is proposed that the selection of Education students contemplates a base criterion of requirement of fluency and reading comprehension at average or above average. Specially adequate tests aimed at assessing the ability to attend Higher Education of candidates who wish to acquire qualifications and competences suitable for the development of their professional paths, seems to us to be a measure adjusted to the specificity of each course. These tests could be combined with an assessment of the candidates' academic and professional curriculum, as well as an interview adapted to each course. In short, it is argued that each Higher Education Institution is responsible for the practices and resources associated with the selection process. Such practices and resources are already common, for example, in Portugal, but for candidates who access Higher Education through the regime of over 23 years old (DGES, 2020), as well as in other countries, such as the United States of America (Hanson et al. al., 2020) or Finland (Kosunen, 2018).

It is the authors' expectation that this study will contribute to filling the gap related to the scarce literature that articulates career development with reading competence. It is important to refer again to the scarcity of literature that explicitly and unequivocally articulates reading skills, access classifications and course choice. No studies have yet been found that present reading fluency as one of the factors that can determine the choice of courses perceived as more or less accessible depending on the average admission. Thus, it is expected that this study will motivate further studies, which are necessary to confirm and better understand the relationship between these variables.

A limitation of this study is related to the measure of desirability of the course based on the access classification (DGES, 2020). Future studies should take into account, in addition to access classifications, other variables that may contribute to the desirability of courses (e.g., social desirability). It is also important to try to understand whether students' career aspirations are affected by reading fluency, thus defining itself as a factor in the origin of the preference for courses with lower access ratings. It is suggested that in future studies the reasons/motivations for choosing the course should also be evaluated, testing a more complex model.

In short, this study suggests that: (i) it is possible and essential to articulate career development and the necessary skills for school success, such as reading skills; (ii) the selection of students in Portuguese Higher Education must be reviewed, in such a way that the distribution among the different areas of study does not reflect asymmetries in terms of fundamental competences such as reading competence and; (ii) that careers with as much influence as those associated with education in preparing future generations be pursued by young people who are motivated to perform them - rather than by young people whose alternatives have been confined to the more accessible options.

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Authors' Contribution:

All authors made substantial contributions to the conception and design of this study, to data analysis and interpretation, and to the manuscript revision and approval of the final version. All the authors assume public responsibility for content of the manuscript.

Associate editor:

Luciana Carla dos Santos Elias

Received: Nov. 10, 2021

1st Revision: Jun. 03, 2022

2nd Revision: Jul. 18, 2022

Approved: Jul. 26, 2022

How to cite this article:

Sucena, A., Marques, C., Silva, A., & Carneiro, J. F. (2022). Reading fluency of higher education students. *Paidéia (Ribeirão Preto)*, 32, e3240. doi:<https://doi.org/10.1590/1982-4327e3240>