

# Relation between State-Test Anxiety and Exam Performance in College Students: Preliminary Analysis of the Difference as per Course.

*Relación entre ansiedad ante exámenes y rendimiento en exámenes en universitarios: análisis preliminar de la diferencia según asignatura*

*Relação entre ansiedade dos testes e o desempenho nos testes da faculdade: análise preliminar da diferença de acordo com o curso*

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**ABSTRACT.** The objective of this study was to find out if the relation between State - Test Anxiety (S-TA) and Exam Performance (EP) varies between two groups of students from different terms. The study was conducted on 76 Psychology program students (87.1 % female) in the fourth term (n = 44), and the seventh term (n = 32), from a private university located in Lima Metropolitan Area, between the ages of 18 and 30 (M = 22.07). The State Test - Anxiety Inventory (S-TAI) and two brief measures—academic self-efficacy and academic emotional exhaustion—were applied. The relation found between S-TA and EP was negative and significant, but of different magnitude according to the academic term. The implications of the study are discussed.

**Key words:**  
test anxiety,  
exam  
performance,  
college  
students,  
comparison

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**RESUMEN.** El objetivo del presente estudio fue conocer si la relación entre la Ansiedad ante Exámenes - Estado (AE-E) y el rendimiento en exámenes (RE) difiere entre dos grupos de estudiantes de ciclos distintos. En el estudio participaron 76 estudiantes de psicología (87.1% mujeres) de cuarto ciclo (n = 44) y séptimo ciclo (n = 32) provenientes de una universidad privada de la ciudad de Lima Metropolitana, con edades entre 18 y 30 años ( $M = 22.07$ ). Se aplicó el Test Anxiety Inventory - Estado (TAI-Estado), y dos medidas breves, de autoeficacia académica y agotamiento emocional académico. La relación hallada entre AE-E y RE fue negativa y significativa, pero de diferente magnitud según el ciclo académico. Se discuten las implicancias del estudio.

**Palabras****clave:**

ansiedad ante exámenes, rendimiento en exámenes, estudiantes universitarios, comparación

**RESUMO.** O objetivo deste estudo foi saber se a relação entre a ansiedade dos testes - Estado (AE-E) e o desempenho em testes de (RE) diferem entre dois grupos de alunos de diferentes ciclos. 76 estudantes de psicologia participaram do estudo (87,1% do sexo feminino), do quarto ciclo (n = 44) e sétimo ciclo (n = 32) de uma universidade particular na cidade de Lima, com idades entre 18 e 30 anos ( $M = 22,07$ ). É aplicado o teste Test Anxiety Inventory - Estado (TAI-estado), e duas medidas curtas, de auto-eficácia acadêmica e exaustão emocional acadêmica. A relação encontrada entre o AE-E e RE foi negativa e significativa, mas de diferentes magnitudes de acordo com o ciclo acadêmico. São discutidas as implicações do estudo.

**Palavras-chave:**

ansiedade de testes, testes de desempenho, estudantes universitários, comparação

The assessment of academic achievement in college life is one of the challenges for researchers, requiring more studies that emphasize aspects that foresee and explain their attainment or hindrance (Fenollar, Román & Cuestas, 2007). Within this framework, one of the most frequent explorations are the studies about the relationship between Test Anxiety (TA), as a State or Trait, and Academic Performance (AP). Empirical reports usually indicate an inverse correlation (Chapell et al., 2005; DordiNejad et al., 2011; Khalaila, 2015; Rana, & Mahmood, 2010; Seipp, 1991), even if unstable relationships have also been found according to the TA dimensions (Heredia, Piemontesi, Furlán, & Hodapp, 2008), relationships of a low magnitude (Farooqui, Ghani, & Spielberger, 2012), and even a lack of association between AP and TA (Contreras et al., 2005; Álvarez, Aguilar, & Lorenzo, 2012). In light of this non-conclusive finding, an analysis of the above research studies allows us to indicate that: (a) general performance (e.g., weighted average or global average) is considered equivalent to exam performance (EP), although the relationship between these two is not even least moderate, a reason why this practice is not recommended (Dominguez-Lara, in press). This behavior would be justified in the study of more general constructs (e.g., learning styles; Lizano, Aryans, Lamb, & Ortiz, 2015), in which it is more reasonable to use the global average as a measurement of the AP; and (b) in research work that takes into account the EP, it is assumed that all the subjects pose a similar degree of difficulty for the students, and therefore, the relationship between TA and EP is independent of this condition and although it is a viable assumption, no supporting evidence has been found.

It is common to find core courses, such as philosophical anthropology, social sciences, general psychology, etc., and study-program specific courses, such as personality psychology, cognitive processes, psychology of the development, etc.) in the study curriculum of the Psychology program of different Peruvian universities.

Passing some core courses, such as statistics, a very demanding and time-consuming subject (Zeidner, 1991) where the student requires to develop analysis-synthesis, mathematical, and statistical skills (Schutz, Drogosz, White, & DiStefano, 1998), is a required condition to register in mandatory courses, such as research methodology, a subject which, besides implementing descriptive and inferential statistics, requires knowledge of psychological evaluation and the theoretical-conceptual understanding of the variables associated with their research. In that sense, the presumption on the differences between the core and mandatory courses in terms of their contents and perceived difficulty is reasonable, and their implications would determine an important role in the students' academic behavior (Escalante, Repetto, & Martinello, 2012).

Psychology students exhibit negative attitudes and behaviors toward statistics and research methodology courses and they participate in this classes with some degree of uncertainty and fear (Freng, Webber, Blatter, Wing & Scott, 2015), and in other cases with a lack of interest because they think that it is unlikely that the contents of these subjects will be applicable to other areas of their academic life or in their professional practice, thus considering them unimportant. (Auzmendi, 1991; Blanco, 2008). For example, they can miss class, stop paying attention to the contents discussed in class, etc. The chances that these negative attitudes and behaviors are acquired at school age are high, because it is reported that school students when attending subjects related to mathematics and statistics perceive and understand that they are difficult to learn and pass, thus generating rejection (Bazan, & Aparicio, 2006) and there is no reason to think that this will change after the start their university studies since most of the students are adapting both adult life and university life (Chávez, & Merino, 2015).

Taking this presumption into account, previous experiences are detrimental determinants for students in their involvement in the research methodology course, opposed to their participation in subjects like psychological evaluation, that would evoke more favorable attitudes as they would be perceived as more closely related to their study program, with a smaller load in content and distant from the application of complex quantitative analysis. In order to delimit this presumption, the assessment of the evaluation of TA and EP—the core proposal of this study—would be a viable alternative.

Within the framework of assessment of TA, it is customary for the type of TA under assessment in these cases to be anxiety as a *trait*, and not as a *state* (Dominguez-Lara, 2016a). Test anxiety as a *State* (TA-S) is defined as the period of transitory anxiety caused by a specific exam situation; however, TA as a *Trait* (TA-T) implies the manifestation of anxiety behaviors before any evaluation situation (Hong, & Karstersson, 2002).

This way, when studying the relationship between TA as a Trait, and the AP in a general way, without considering the type of subject as an important factor, the possibility of a more focused intervention in the students taking courses with higher failure rates could be lost, even when there is evidence of

the potential differences between the AE during the assessment of different subjects (Everson, Tobias, Hartman, & Gourgey, 1993; Sapp, Farrel, & Durand, 1995) If not approached, in the medium term, academic failure would be associated with a greater emotional burden for the student, with a lower degree of well-being as a consequence, as well as a potential delay in graduating, or even dropping out. In addition, when assessing only the trait measurement (TA-T), the exam situation becomes secondary and the interventions would not consider those cognitive processes that are affected by the presence of TA-S during assessments, such as selective attention and concentration (Fernandez-Castillo & Caurcel, 2015) or the working memory (Ikeda, Iwanaga & Seiwa, 1996).

Therefore, this study will examine the relationship between TA-State and EP by comparing two courses with different objectives and perception of difficulty (a psychological evaluation course and a research methodology course).

## METHOD

### Participants

This comparative study (Ato, Lopez & Benavente, 2013) included an intentional sample comprised of 76 university students (87.1% women) of the fourth semester ( $n = 44$ ) and seventh semester ( $n = 32$ ) of the Psychology study program of a private university located in Lima. The ages ranged between 18 and 30 years ( $M = 22.07$ ,  $SD = 3.22$ ) without significant differences between men and women ( $t_{[68]} = .039$ ,  $p = .969$ ,  $d = .01$ ).

In the fourth-semester group, we considered a psychological evaluation course, while in the seventh-semester group, it was a research methodology course. No significant differences were observed regarding the distribution of men and women according to the course ( $\chi^2_{(1)} = .638$ ,  $p = .424$ ,  $V = .095$ ).

### Instruments

**Final exam of the Psychological Evaluation course.** The final exam was made up of 11 questions with different formats (true/false, multiple choice, relationships, fill in the blanks, case analysis, interpretation, and comparison). The maximum grade was 20 points and the average time to complete it was 80 minutes.

**Final exam of the Research Methodology course.** The final exam was made up of 10 questions (multiple choice, elaboration, true/false, fill in the blanks). The maximum grade was 20 points and the delimited time of completion was 1 hour.

**Test Anxiety Inventory – State (TAI-State; Dominguez-Lara, 2016a).** The TAI-State assesses anxiety over tests as a unidimensional construct and is made up of 15 items with four answer alternatives (*Not at All*, *Somewhat*, *Quite a Lot* and *Excessively*). In order to focus the respondents in the exam situation, all the statements are preceded by the phrase “During the exam...”

**Single Academic Self-efficacy Item (IUAA; Dominguez-Lara, & Merino-Grove, in press).** This is a general self-efficacy measurement whose content is: *How sure are you that you will be able to do*

*your assignments efficiently (homework, presentations, exams, etc.) required by your academic life?* It is organized on a five-point ordinal scale (*Not Sure at All, A Little Sure, Somewhat Sure, Pretty Sure, and Very Sure*). Presents evidence of convergence validity ( $r = .562$ ) with extensive measurements of academic self-efficacy already validated in Peruvian samples (Dominguez 2014a; Dominguez, Villegas, Yauri, Mattos & Ramírez, 2012).

**Single Item of Academic Emotional Exhaustion (IUAEA; Dominguez-Lara, & Merino-Soto, under review).** It is a global measurement of academic emotional exhaustion. The contents of the items are: *I feel emotionally exhausted (stress, anguish, worry) because of the assignments (homework, presentations, exams, etc.) demanded by my academic life.* The answers are provided with a five-point ordinal scale (from *Strongly Disagree* to *Strongly Agree*). It is strongly related ( $r = .496$ ) to an academic emotional exhaustion measurement validated in college students from Lima (Dominguez, 2013a, 2014b).

### Procedure

The TAI-State, IUAA, and IUAEA instruments were applied immediately following the final exam. Students were instructed to answer them based on how they felt during the exam, except for the academic auto-efficacy and academic emotional exhaustion items, which were to be answered in a general manner. Prior to that, they had been informed of the study objectives, advising them also that their participation was voluntary, that they were not to receive any academic rewards (e.g., additional points in the exam), and that the answers they provided would be confidential. Only one seventh-semester female student decided not to participate. When they finished, they were thanked for their cooperation.

**Preliminary Analysis.** First, a series of analyses were performed in order to assure to the extent possible, the equivalence between both samples given that due to their size they were more prone to varied bias. The standardized asymmetry index (*SSI*; Malgady, 2007) was implemented as an approximation to the univariate normalcy in each group ( $SSI < .25$ ).

Next, dimensionality was assessed separately with an exploratory factorial analysis using the generalized least squares method and forcing the extraction to a single factor. Initially, the reliability of the scores observed with the  $\alpha$  coefficient (Cronbach, 1951) with confidence intervals (Dominguez, 2016b) with the *ICalfa* module (Dominguez, & Merino, 2015), expecting high magnitudes ( $> .80$ ; Merino, Navarro, & García, 2014). While the samples are small, with a proper dimensionality ( $\lambda_1 > 6.00$ ), even with 30 individuals unbiased estimators can be obtained (Yurdugül, 2008). Moreover, the Angoff-Feldt coefficients ( $r_{AF}$ ; Angoff, 1953; Feldt, 1975) were calculated with the *RAF* module (Dominguez-Lara, Merino-Soto, & Navarro-Loli, 2016). The  $\alpha$  coefficients obtained in both groups were compared with the Feldt and Kim (2006) method, used in small samples ( $n < 100$ ) or few items ( $1 < k < 4$ ), using the *LittleAlpha* software (Merino-Soto, 2016). This procedure is required in order to verify the equivalence in terms of the estimation of the measurement error (Merino & Lautenschlager, 2003).

Later, the analysis of bivariate outliers was implemented (potential influencing cases) through the inspection of the scatter graph (TA-State/ Final Exam Grade) in both groups, separately. The potential influence of the cases selected was evaluated with a regression analysis, considering the variance change explained by the dependent variable with and without those cases. It is worth

mentioning that the magnitude of the correlation was used as a measurement of practical significance (Ferguson, 2009), because, because due to the sample size the independence-free hypothesis may be accepted. In this sense, the .20, .50, and .80 magnitudes are interpreted as a *minimum required*, *moderate*, and *strong* association.

After that, the age was correlated with the AE-State and the final exam Grade through the Pearson coefficient with the above criteria (Ferguson, 2009). Similarly, men and women were compared with regards to both variables using Student's *t*, complementing the calculation with Cohen's *d* (Cohen, 1992; Dominguez, 2013b). The value of *d* based on its magnitude indicates a *small* (.20), *medium* (.50), and *large* (.80) difference (Cohen, 1992; Ellis, 2010), or, following a more stringent criterion (Ferguson, 2009), .41, 1.15, 2.70 as a *minimum required*, *moderate*, and *strong* difference.

To wrap it up, the association existing between the academic semester and the academic self-efficacy, academic emotional exhaustion, and number of students who passed/failed was analyzed. For that, Pearson's  $\chi^2$  was used, which was complemented with Cramer's *V* (or  $\phi$  in 2 x 2 tables) as a measurement of practical significance (Cohen, 1992). The value of *V* depends on the size of the lower *gl*. In this case, .10, .30, and .50 are interpreted as a *small*, *medium*, and *large* association (Cohen, 1992), respectively; or .20, .50, and .80 as a *minimum required*, *moderate*, and *strong* association (Ferguson, 2009). This with the purpose of assessing if both semesters have both constructs at the same magnitude, since there is preliminary evidence of their relationship with TA in college students in Lima (Dominguez, 2014b; Dominguez, Villegas, Cabezas, Aravena & De la Cruz, 2013).

It is worth highlighting that the analyses were performed taking men and women as a group in light of prior evidence of measurement invariance regarding TA (Dominguez-Lara, under review).

**Main Analysis.** Correlations between AE-State and Final Exam Grade observed in each group were compared with a method for independent correlations based on confidence intervals (Zou, 2007) and complemented through a method of practical significance such as Cohen's *q* (Cohen, 1992). The .10, .30, and .50 values are indicators of a *small*, *medium*, and *large* difference (Cohen, 1992).

## RESULTS

**Preliminary Analysis** Descriptive analyses carried out in the seventh-semester group indicate low asymmetry magnitudes for AE-S (*SSI* = .010) and the Grades (*SSI* = .021). A similar image can be seen in those from the fourth-semester both in TA-S (*SSI* = .002) and the Grades (*SSI* = .087).

In both groups, the appropriate conditions to conduct a factor analysis existed (*KMO* > .800; significant Bartlett's Test). The fourth-semester group, the extracted factor ( $\lambda_1 = 7.886$ ) explains 52.570% of variability, with factor loads that range between .463 and .886; and in the seventh-semester group, the ( $\lambda_1 = 9.366$ ) factor explains a greater amount of variability (62.438%), with loads that range from .628 to .922.

High reliability coefficients were obtained for the seventh-semester group ( $\alpha_{7th} = .955$ , CI95% .909 - .978;  $r_{AF} = .931$ ) and the fourth-semester group ( $\alpha_{4th} = .931$ , CI95% .870 - .964;  $r_{AF} = .926$ ), without evidencing statistically significant differences among the  $\alpha$  coefficients ( $W_{(34,29)} = 1.533$ ,  $p = .122$ ).

Regarding the bivariate outliers, in the fourth-semester group, the initially observed correlation between AE-State and Final Exam Grade was close to zero ( $r = -.089$ ;  $p = .566$ ), but in the plotter graph, six cases outside the pattern were found (see Figure 1). The regression analysis implemented indicates that the AE-S explains less than 1% of the variability of anxiety over exams and has an insignificant non-standardized coefficient ( $R^2 = .008$ ;  $B = -.021$ , CI95%  $-.095$ ,  $.053$ ). However, once the six cases were removed, the model improves significantly ( $R^2 = .213$ ;  $B = -.111$ , CI95%  $-.184$ ,  $-.039$ ), and the correlation between AE-State and Final Exam Grade increased ( $r = -.358$ ;  $p = .027$ ) resulting in a moderate magnitude (Ferguson, 2009). To complement it, a moderate difference between both correlations was observed ( $q = .255$ ), which indicates that those cases need to be removed.

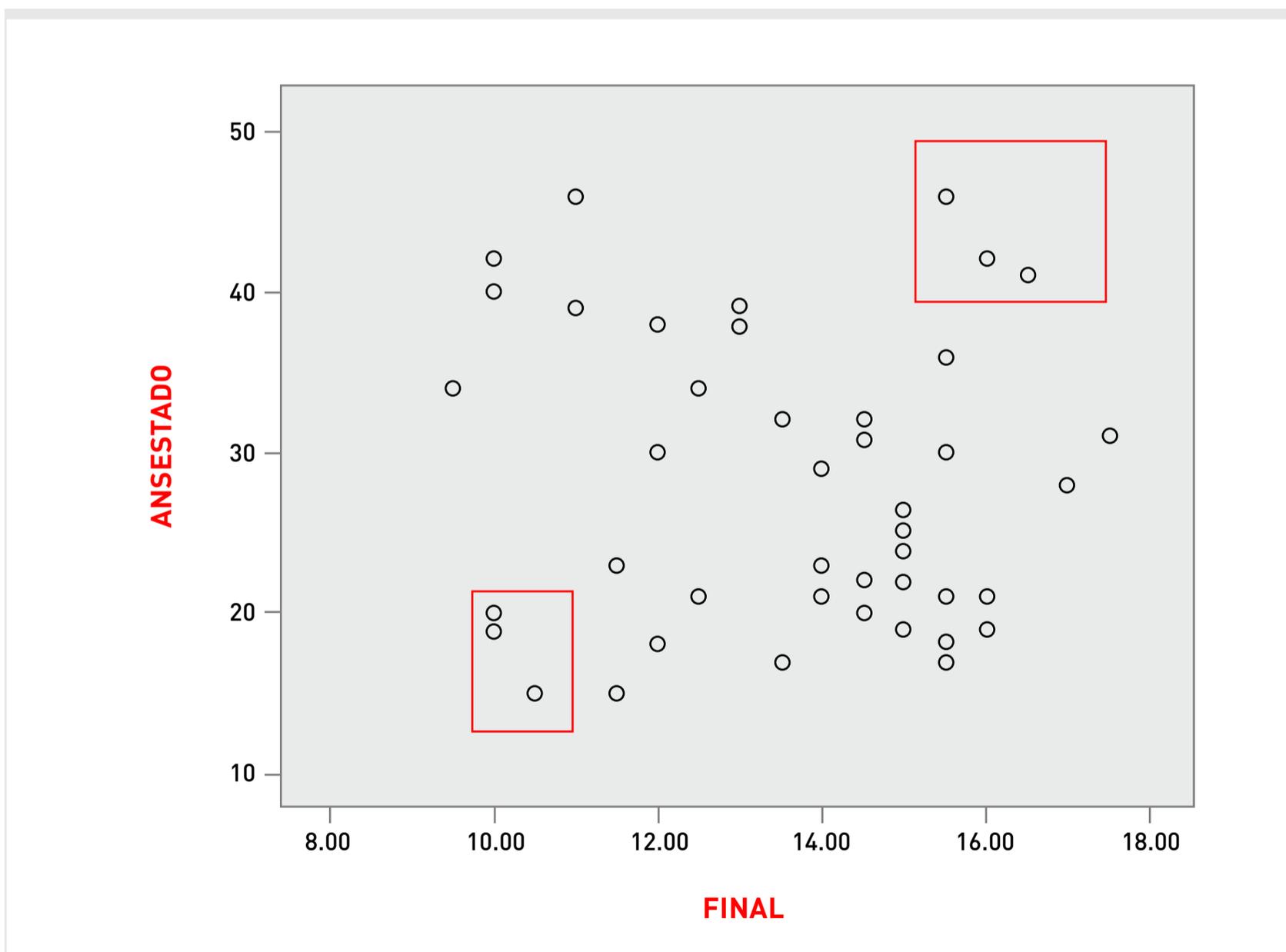


Figure 1. Relationship between TA-State and Final Exam Grade in fourth-semester students

In the seventh-semester group, the initial correlation had a magnitude higher than that of the previous group ( $r = -.200$ ;  $p = .273$ ), although within the limit of practical significance (Ferguson, 2009). Only a potential influential case was found, but its removal did not mean any significant improvement in the correlation ( $r = -.243$ ;  $p = .187$ ;  $q = .041$ ). Hence it was decided to maintain the sample with the original number of participants.

Insignificant correlations between age and TA-State ( $r = -.026$ ,  $p = .834$ ), as well as between age and Final Exam Grade ( $r = -.083$ ,  $p = .495$ ) were found. Additionally, women and men exhibited similar magnitudes both of TA-State ( $t_{[68]} = -.314$ ,  $p = .754$ ,  $d = .11$ ) and of Final Exam Grade ( $t_{[68]} = .488$ ,  $p = .627$ ,  $d = .17$ ). In addition, fourth- and seventh-semester students do not differ in terms of their academic auto-efficacy ( $\chi^2_{[2]} = 1.622$ ,  $p = .444$ ,  $V = .152$ ) nor in the academic emotional exhaustion ( $\chi^2_{[4]} = 5.965$ ,  $p = .202$ ,  $V = .292$ ). However, moderate differences were found regarding distribution of passing (grade  $\geq 10.5$ ) and failing students in both semesters ( $\chi^2_{[1]} = 13.818$ ,  $p < .001$ ,  $V = .444$ ). Only 53.125% of seventh-semester students passed, while 92% of the fourth-semester students obtained a passing grade.

These general results show that both groups are equivalent, except in regards to the number of students who passed in each subject.

**Main Analysis.** The difference between the observed correlations of TA-State and Final Exam Grade was not statistically significant ( $r_{4th} = -.358$ ,  $r_{7th} = -.200$ ;  $CI_{diff} = -.596, .286$ ). However, given that the estimate is influenced by the size of the sample, a complementary analysis of the practical significance of the difference between both correlations shows a magnitude close to the moderate category ( $q = .158$ ).

On the other hand, taking the total sample as the benchmark, the correlation observed is .212 ( $p = .078$ ), which is statistically different from that found in the fourth semester ( $q = .146$ ), but similar to that of the seventh semester ( $q = .012$ ).

## DISCUSSION

The study on exam performance and TA assessment requires still more evidence so as to understand the nature of its complex relationship. However, the findings presented involve some progress in terms of the consideration of type of subject-matter.

The connection found between TA-S and exam performance follows the line of previous research works that make an inverse association between TA and AP (Chapell et al., 2005; DordiNejad et al., 2011; Khalaila, 2015; Rana, & Mahmood, 2010; Seipp, 1991), even though in this work this association varies according to the type of subject-matter. This finding strengthens when both semesters are statistically equal in terms of academic self-efficacy and academic emotional exhaustion. Similarly, women and men are matched in terms of TA-S and exam performance, and there are no significant correlations between performance and TA-S with age. Consequently, an aspect to be highlighted is that the correlation between TA-S and exam performance is usually underestimated when computed with the total sample, i.e., with both groups as a whole.

In view of the preliminary nature of this report, the size of the sample and the participation of students from a single study program may seem to be the main limitations. In spite of that, the results found open doors for a deepening into the potential mediating factors, i.e., the analysis of possible causes for the differences found in the relationship.

As to the future lines of research, the preparation of explanatory models that allow to predict the students' performance may be considered, models which consider the most relevant academic variables in the development of a certain group of courses, since the reactions tend to be different according to the type of subject (Freng et al., 2015). For example, maybe the learning strategies used by the student may be different between a subject connected to statistics and another one linked to the theoretical study of motivation and emotion. For that reason, for a proper assessment, it seems important to analyze the subject-matters separately, as well as those emotions (e.g., anxiety) or beliefs (e.g., self-efficacy) that may come up in the students and that may have an influence on their evaluation results.

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