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Editorial EOS

Relationships between state and trait anxiety with verbal and graphic creativity in students in compulsory Secondary Education

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Abstract

Introduction. The aim of this research was to examine the relationship between state and trait anxiety and verbal and graphic creativity, as well as how the two types of anxiety contribute to predicting creativity in students of Compulsory Secondary Education.

Method. The study was conducted with 89 subjects of both sexes between the ages of 12 and 14. The State/Trait Anxiety Inventory was applied, consisting of two independent scales that measure transitory situations and general experiences of stress, and the *Prueba de Imaginación Creativa* [Test of Creative Imagination], which assesses two types of creativity in their verbal and graphic manifestations, and creative imagination or total creativity.

Results. The results showed a negative, statistically significant relationship between both types of anxiety and verbal and graphic creativity; the relationship with trait anxiety being stronger and more significant. However, neither state anxiety nor trait anxiety was a good predictor of verbal and graphic creativity and creative imagination, although the first was more predictive than the second.

Discussion and conclusions. The research findings are interesting because of the data they contribute regarding the relationship between anxiety and creativity.

Keywords: state anxiety, trait anxiety, creative imagination, verbal creativity and graphic creativity.

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Relaciones entre la ansiedad estado y rasgo con la creatividad verbal y gráfica en alumnos de Educación Secundaria Obligatoria

Resumen

Introducción. El objetivo de esta investigación fue examinar las relaciones existentes entre la ansiedad estado y rasgo y la creatividad verbal y gráfica así como la contribución de los tipos de ansiedad en la predicción de la creatividad en alumnos de Educación Secundaria Obligatoria.

Método. El estudio se realizó con 89 sujetos, de ambos sexos en edades comprendidas entre 12 y 14 años. Para ello, se aplicaron el Cuestionario de Autoevaluación Ansiedad Estado/Rasgo, formado por dos escalas independientes que miden situaciones transitorias y vivencias generales de tensión, y la Prueba de Imaginación Creativa, que evalúa dos tipos de creatividad con sus manifestaciones verbal y gráfica y la imaginación creativa o creatividad total.

Resultados. Los resultados mostraron una relación negativa y estadísticamente significativa entre los dos tipos de ansiedad y la creatividad verbal y gráfica, siendo más elevada y significativa con la ansiedad rasgo. Sin embargo, ni la ansiedad estado ni la ansiedad rasgo resultaron buenas predictoras de la creatividad verbal y gráfica y de la imaginación creativa, si bien la primera tuvo mayor capacidad predictiva que la segunda.

Conclusiones. Las conclusiones del estudio resultan interesantes a nivel de investigación pues aportan datos sobre las relaciones de la ansiedad con la creatividad.

Palabras clave: ansiedad estado, ansiedad rasgo, imaginación creativa, creatividad verbal y creatividad gráfica.

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Introduction

Anxiety is a negative emotion that affects a person's survival and well-being; it is a process that intervenes in the adaptation and organization of one's behavior. Since anxiety is an ambiguous concept, it has been defined in several ways – as a state, a trait, a stimulus, an impulse, a motive and a force. Cattell and Scheier (1961) were the first to differentiate anxiety as a state from anxiety as a trait. Spielberger (1966) defined state anxiety as a transitory emotional experience characterized by agitation, and trait anxiety as an individual's predisposition to response in a determined way.

Anxiety can mediate certain cognitive processes that intervene in creative performance. It is known to affect attention, working memory, and long-term memory (Fales *et al*., 2008; Tohill & Holyoak, 2000); it even has a negative correlation with verbal and graphic creativity (Garaigordobil & Pérez, 2002). In fact, some research indicates that anxiety influences the thought of creative persons, making it less efficient. Consequently, the breadth of attention in creative persons usually decreases, both in terms of perception – because they cannot select a large number of stimuli and their cognitive focus is being led by peripheral cues (Ansburg & Hill, 2003) – and in conceptual terms, since they have difficulty producing different connections (Mumford & Gustafson, 1988). Furthermore, anxiety causes deficits in the working memory of creative subjects (Richards, French, Keogh, & Carter, 2000); instead of using working memory to combine multiple ideas and create mental images, it is occupied in recurring thoughts about the situation that is generating anxiety (Scott, Lonergan & Mumford, 2005). The same occurs with long-term memory, also affected by anxiety, resulting in a tendency for creative people to remember the information in congruence with their emotional experience (Eysenck & Mathews, 1987) without leaving space for new associations, or for accessing them, if such associations are actually made (Heilman, Nadeau, & Beversdorf, 2003).

Creativity is a multidimensional term that speaks of generating ideas that are plentiful (fluidity), varied (flexibility), new (originality) and detailed (elaboration). This capacity is therefore well suited to solving problems and developing novel products that are considered useful to society (Guilford, 1984; Sternberg & Lubart, 1999). Taking this line of thought, creativity can be analyzed from four different perspectives: a concrete product, a conscious and unconscious process, a person with special traits, and a social environment where it manifests

itself. To think of creativity as the capacity to produce something that is new, useful, important and of good quality is the most common way to recognize a person as being creative; when the outcome is original and useful, it is easy to infer that the procedure that produced it was creative. Additionally, creativity can be understood as a process of producing and communicating new, significant connections, where different forms of thought are used and action alternatives are elaborated and selected. Likewise, creativity results from the interaction of qualities that a person possesses and that are projected to a greater or lesser degree according to the circumstances (Sternberg & Lubart, 1995). The creative person is curious about things that happen in life, has confidence in his or her possibilities, tolerates ambiguity, is flexible and extroverted, lives in harmony with his or her emotions while being sensitive to the emotions of others, and finally, accepts risk when he or she wants to take a certain mental leap in their production (Barron & Harrington, 1981; Kashdan & Fincham, 2002; Sternberg & Lubart, 1993). The environment, of course, has its influence on creativity, since it helps make the most of creative performance by fostering inspiration and evaluating results.

The relationship between anxiety and creativity has been analyzed in numerous studies, with contradictory results, since anxiety has been shown to be negatively connected (Matthews, 1986), positively connected (Swanner, 1985) or have no significant relationship (Kaufmann & Vosburg, 1997) with performance on creative tasks. Likewise, research suggests that anxiety has many debilitating effects, for example, it can block complex learning (Eysenck, Derakshan, Santos, & Calvo, 2007). In fact, several theoretical models, such as the dual processing model (Kinsbourne & Hicks, 1978), the cognitive interference model (Tobias, 1985) and the behavioral inhibition model (Flaherty, 2005) indicate the harmful consequences of anxiety on creativity, where anxious individuals seem to think inefficiently (Eysenck *et al*., 2007). Anxiety also has some encouraging effects, such as motivating effort in solving a task (Jones, Hanton & Swain, 1994) and increased adoption of achievement goals (Elliot & McGregor, 1999).

Finally, there is research that looks into the influence of anxiety – whether state or trait – on verbal and graphic creativity. Specifically, it has been observed that trait anxiety has a greater negative influence than state anxiety on creative performance, and that anxiety in general intervenes more negatively in verbal creativity than in graphic creativity (Byron & Khazanchi, 2011). However, more research studies are needed that jointly study creativity and

the two types of anxiety, using school samples where the two variables are identified and assessed.

For these reasons, in light of the rather confusing results that are discussed above, the present investigation, carried out with students from compulsory secondary education, had two objectives: 1) to analyze existing relationships between state and trait anxiety and verbal and graphic creativity, and 2) to estimate the contribution of these two types of anxiety in predicting creative performance through words and pictures.

Method

Participants

A total of 89 subjects participated in the study, of both sexes (48 boys and 41 girls), between the ages of 12 and 14 (M = 12.91; SD = 0.67), drawn from one public school and one private school in a middle-to-upper class neighborhood in the city of Pamplona. The assessment was carried out during school hours, student participation was voluntary, although prior authorization from parents was obtained, and classroom climate was one of curiosity, acceptance and collaboration.

Instruments of measure

In order to assess the variables in the study, the following instruments were used:

State Trait Anxiety Inventory (STAI). This questionnaire, designed by Spielberger (2001), was conceived as a research tool for a study on anxiety in schoolchildren between the ages of 9 and 15. It is made up of two independent, self-assessment scales for measuring two aspects of anxiety. The *state anxiety scale* comprises 20 elements where subjects express "how they feel at a given moment", and try to assess subjective feelings of apprehension, tension and worry that fluctuate in intensity over time. The *trait anxiety scale* also contains 20 elements, where subjects can indicate "how they feel in general"; it seeks to measure relatively stable differences in a propensity toward anxiety among subjects who tend to show states of anxiety. This questionnaire requires an adequate level of reading comprehension in order to understand the verbal content of the stimuli, and it may be applied individually or collectively in approximately 20 minutes' time. It shows high reliability for both trait anxiety ($\alpha = 0.93$)

and state anxiety (α = 0.87). As for concurrent validity, the trait anxiety scale was observed to correlate positively and significantly (*r* = 0.75) with the *Children's Manifest Anxiety Scale* (Castaneda, McCandless & Palermo, 1956).

Prueba de Imaginación Creativa (PIC) [Test of Creative Imagination]. This test was designed by Artola, Ancillo, Mosteiro, and Barraca (2004) in order to assess verbal creativity and graphic creativity. It includes four games, the first three assess verbal creativity and the fourth, graphic creativity, and it can be administered individually or collectively in approximately 45 minutes. In game 1, based on a situation shown in a picture (a child opening a chest), the subject must write down everything that might be happening in the scene; in game 2, an adaptation from the Guilford Test ("Uses for a brick"), the subject must answer with possible uses for a rubber hose; in game 3, an implausible situation is posed so that the student will express unconventional ideas that he or she would probably not venture to express in more serious situations, and finally, in game 4, inspired by certain items from the Torrance Test (Torrance, 1974), the subject has to complete four drawings that have been started with a few strokes, and to give a title to each one. This test produces three scores: a) verbal creativity, composed of narrative fluidity, flexibility and originality; b) graphic creativity, made up of originality, elaboration, title and special details, and c) a total score that indicates imagination or creative fantasy that the child has demonstrated in performing the tasks. The test presents highly satisfactory reliability (α = 0.87) and positive, significant concurrent validity with the *Test de Inteligencia Creativa* [Creative Intelligence Test] (Corbalán *et al*., 2003), both on verbal creativity *(r* = 0.43) and on graphic creativity (*r* = 0.21) and in creative imagination or total creativity (*r* = 0.44). In the sample studied here, reliability obtained for verbal creativity was *r* = 0.85, for graphic creativity *r* = 0.79 and for creative imagination, *r* = 0.80.

Procedure

Tests were performed in a single session that lasted 1½ hours. First, the State Trait Anxiety Inventory (STAI) was administered. This occupied 25 minutes, five minutes to read the instructions and answer any questions about the vocabulary and the way to answer the questionnaire, and 20 minutes to respond to the two scales that make up the test. Second, the *Prueba de Imaginación Creativa* [Creative Imagination Test] was applied, taking a total of 45 minutes, five minutes to explain the instructions given for each of the games and to answer any questions, and 40 minutes to complete all the games (10 minutes for each of the four games).

Data analysis

Data analysis was carried out using Peason correlation coefficients and the simple linear regression model, both calculated using SPSS 19.0 software.

Results

Results from this study are shown in two sections where the correlations between the different types of anxiety and creativity are discussed, followed by estimated contribution of the types of anxiety in predicting creative results.

Correlations

In order to determine any existing relationships between state and trait anxiety and verbal and graphic creativity, with their respective indices, and creative imagination, Pearson correlation coefficients were found using subjects' direct scores from the tests that were administered (Table 1).

***Table 1.*Correlations between state and trait anxiety, indices of verbal and graphic creativity and creative imagination. (N = 89)**

	1	2	3	4	5	6	7	8	9	10	11
1- SA	--										
2- TA	0.87**	--									
3- Flu	-0.33**	-0.50**	--								
4- Fle	-0.33**	-0.50**	0.89**	--							
5- VO	-0.29**	-0.48**	0.64**	0.69**	--						
6- VC	-0.35**	-0.53**	0.95**	0.96**	0.80**	--					
7- GO	-0.30**	-0.32**	0.12	0.15	0.22*	0.17	--				
8- Elb	-0.23*	-0.31**	0.15	0.17	0.18	0.18	0.73**	--			
9- Tit	-0.32**	-0.46**	0.10	0.07	0.16	0.11	0.31**	0.35**	--		
10- SpD	-0.09	-0.06	-0.01	-0.00	0.11	0.02	0.66**	0.46**	0.19	--	
11- GC	-0.34**	-0.43**	0.13	0.14	0.23*	0.17	0.85**	0.78**	0.71**	0.66**	--
12- CI	-0.40**	-0.59**	0.93**	0.94**	0.81**	0.98**	0.32**	0.33**	0.24*	0.15	0.35**

Note. SA = State Anxiety; TA = Trait Anxiety; Flu = Fluidity; Fle = Flexibilty; VO= Verbal Originality; VC = Verbal Creativity; GO = Graphic Originality; Elb = Elaboration; Tit = Title; SpD = Special Details; GC = Graphic Creativity; CI = Creative Imagination.

* $p < .05$ ** $p < .01$

The correlation between state and trait anxiety was positive, strong, and statistically significant (r = 0.87, p < .001), while the correlation between verbal and graphic creativity was also positive but quite weak and not significant (r = 0.17, p < .11). If we analyze the correlations found between state and trait anxiety and each of the indices that make up verbal creativity (fluidity, flexibility and narrative originality) and graphic creativity (originality, elaboration, title and special details), we observe that both the scores from these indices and the scores on verbal creativity, graphic creativity and creative imagination have a negative, statistically significant correlation with the two types of anxiety, with the exception of the special details index, where the association was negative but not statistically significant for either state anxiety (r = -0.09, p < 0.50) or trait anxiety (r = -0.06, p < .57). Furthermore, all the indices that make up the two types of creativity have a stronger negative, significant correlation with trait anxiety than with state anxiety. The same is true of correlations of verbal creativity (r = -0.53, p < .001), graphic creativity (r = -0.43, p < .001) and creative imagination (r = -0.59, p <.001) with trait anxiety; in the case of state anxiety, the correlations of verbal creativity (r = -0.35, p <.001), graphic creativity (r = -0.34, p <.001) and creative imagination (r = -0.40. p < .001) are weaker.

Another result worth highlighting is that correlations between both types of creativity and creative imagination are both positive and statistically significant; however, the association was much stronger with verbal creativity (r = 0.98, p<.001) than with graphic (r = 0.35, p < .001). The same occurs with their respective indices: fluidity (r = 0.93, p <.001), flexibility (r = 0.94, p<.001) and narrative originality (r = 0.81, p <.001), from verbal creativity; and graphic originality (r = 0.32, p <.001), elaboration (r = 0.33, p<.001), title (r = 0.24, p < .02) and special details (r = 0.15, p < .17), from graphic creativity.

Finally, it can be affirmed that anxiety and creativity are inversely related, that is, as one increases the other decreases, and vice versa. Thus, more anxious subjects show less creativity, and more creative subjects show less anxiety.

Variables that predict creativity

Two simple linear regression analyses were performed. In the first, state anxiety was taken as a predictor of verbal and graphic creativity, with its respective indices, and of crea-

tive imagination (Table 2); in the second, trait anxiety was selected as predictor of the same variables (Table 3).

***Table 2*. Simple linear regression analysis of state anxiety for predicting its relationship with the indices of verbal and graphic creativity and with creative imagination. (N = 89)**

Variables			Non-standardized Coefficients		Standardized Coefficients		
	R^2	ΔR^2	B	ES	β	*t*	*ρ*
Flu	0.11	0.10	-0.41	0.13	-0.33	-3.25	0.002
Fle	0.11	0.10	-0.34	0.12	-0.33	-3.27	0.002
VO	0.09	0.08	-0.21	0.07	-0.29	-2.86	0.005
VC	0.12	0.12	-1,01	0.29	-0.35	-3.48	0.001
GO	0.09	0.08	-0.07	0.02	-0.30	-2.93	0.004
Elb	0.05	0.04	-0.03	0.02	-0.23	-2.16	0.033
Tit	0.10	0.09	-0.09	0.03	-0.32	-3.12	0.002
SpD	0.01	-0.00	-0.01	0.01	-0.09	-0.84	0.400
GC	0.12	0.11	-0.20	0.06	-0.34	-3.39	0.001
CI	0.16	0.15	-1.21	0.30	-0.40	-4.04	0.000

Note. Flu = Fluidity; Fle = Flexibilty; VO= Verbal Originality; VC = Verbal Creativity; GO = Graphic Originality; Elb = Elaboration; Tit = Title; SpD = Special Details; GC = Graphic Creativity; CI = Creative Imagination.

***Table 3.* Simple linear regression analysis of trait anxiety for predicting its relationship with the indices of verbal and graphic creativity and with creative imagination. (N = 89)**

Variables			Non-standardized Coefficients		Standardized Coefficients		
	R^2	ΔR^2	B	ES	β	*t*	*ρ*
Flu	0.24	0.24	-0.54	0.10	-0.49	-5.32	0.000
Fle	0.24	0.24	-0.52	0.10	-0.49	-5.32	0.000
VO	0.23	0.22	-0.30	0.06	-0.48	-5.07	0.000
VC	0.28	0.28	-1.36	0.23	-0.53	-5.87	0.000
GO	0.10	0.09	-0.07	0.02	-0.32	-3.16	0.002
Elb	0.09	0.08	-0.04	0.01	-0.31	-3.02	0.003
Tit	0.21	0.20	-0.11	0.02	-0.46	-4.76	0.000
SpD	0.00	-0.01	-0.01	0.01	-0.06	-0.57	0.568
GC	0.18	0.17	-0.23	0.05	-0.43	-4.44	0.000
CI	0.35	0.34	-1.59	0.23	-0.59	-6.80	0.000

Note. Flu = Fluidity; Fle = Flexibilty; VO= Verbal Originality; VC = Verbal Creativity; GO = Graphic Originality; Elb = Elaboration; Tit = Title; SpD = Special Details; GC = Graphic Creativity; CI = Creative Imagination.

The results presented in Tables 2 and 3 show that both state anxiety and trait anxiety have little predictive capacity for any of the indices that make up verbal and graphic creativity and creative imagination. However, it can be observed that this capacity is slightly higher in the case of trait anxiety for predicting verbal creativity [R^2 = 0.28; ΔR^2 = 0.27; $t(87)$ = -5.87;

$p \leq 0.001$], graphic creativity [$R^2 = 0.18$; $\Delta R^2 = 0.17$; $t(87) = -4.44$; $p \leq 0.001$] and creative imagination [$R^2 = 0.35$; $\Delta R^2 = 0.34$; $t(87) = -6.80$; $p \leq 0.001$], than in the case of state anxiety for predicting the same variables. These data suggest that neither state anxiety nor trait anxiety offers practically any prediction of the two creativity types or of creative imagination. Moreover, since the relationship between the two variables (anxiety and creativity) is negative or inverse, we can indicate that high levels of anxiety offer a prediction of lower creativity.

In summary, it can be said that students with high levels of anxiety had greater difficulty in carrying out the tasks on the *Prueba de Imaginación Creativa* [Test of Creative Imagination], especially if such anxiety was more permanent than transitory.

Discussion and conclusions

Results from this study show that there is a negative, significant association between the types of anxiety (state and trait) and the types of creativity (verbal and graphic) that were assessed. This indicates that the two variables are mutually related. In fact, the students with high levels of anxiety performed more poorly on the creative tasks, and vice versa, the creative students reflected lower levels of anxiety. Furthermore, creative performance was poorer when subjects presented greater trait anxiety than state anxiety. Relationships observed between the STAI and the PIC scores confirm findings from other research, namely, that trait anxiety – a subject's own predisposition in responding to different tasks – has more of a determining influence than does state anxiety – a transitory emotional experienced characterized by the agitation of the moment (Byron & Khazanchi, 2011).

One possible theoretical explanation of these results is that trait anxiety consumes cognitive resources that creative people need in order to elaborate a creative product (Fuster, 2002). This consumption distracts and reduces one's ability to simultaneously consider multiple ideas, create mental images and make unusual connections. Similarly, high levels of trait anxiety hinder the activity of working memory and of long-term memory in creative people, and reduce their capacity for attention (Shackman *et al*., 2006). In this way, subjects that present continued trait anxiety are deficient when required to produce many ideas that belong to different categories and are original in nature, because their working memories are occupied with recurrent thoughts about the topic that produces anxiety. When called on to recall and to

establish remote ideas between concepts, the long-term memory of these anxious subjects is constrained because they focus more on peripheral data than on the central data.

Another important aspect of the study was that trait anxiety showed a higher explanatory capacity in the total variability of creativity than did state anxiety, whether in the indices that make up verbal creativity (fluidity, flexibility and narrative originality), graphic creativity (originality, elaboration, title and special details) or in creative imagination. It could be that the subjects who present higher levels of trait anxiety present a more stable predisposition, which would have more regular influence when the subject performed tasks that require great effort and persistence – as with tasks that have more than one method of execution, in other words, creative tasks. State anxiety, however, is a poorer predictor of subjects' level of creativity than is trait anxiety; since it is a more fleeting emotion, it is more affected by other types of factors such as the complexity of the proposed tasks or the age of the participants, as was postulated in other investigations (Eysenck *et al*., 2007; Papousek, Schulter, & Lang, 2009).

In summary, this study supports other investigations that indicate that anxiety has a negative influence on the creative performance of subjects (Matthews, 1986), due fundamentally to the interference of anxiety in cognitive processes responsible for creativity. In fact, individuals who are prone to be anxious dedicate a greater amount of cognitive resources (for example: attention, working memory or long-term memory) to addressing the characteristic anxiety symptoms than to efficiently solving the creative tasks. Future research could expand the study of specific cognitive processes that may exercise some influence on creativity, or look further into an idea formulated in two relatively recent studies (Gilhooly, Fioratou, Anthony, & Wynn, 2007; Shackman *et al*., 2006), suggesting that visual processes may contribute to explaining the negative association between anxiety and execution of divergent thinking tasks. In addition, it would also be interesting to create programs that train subjects to learn to relax, thus encouraging the expression of their creativity (Krampen, 1998).

Finally, the present study suffers from certain limitations: the rather limited sample size, suggesting caution when generalizing the data; sample selection based on the researcher's possibilities for gaining access to the schools, hence a non-random selection; and finally, the absence of data from applied neuroimaging techniques that would make it possible to examine the neuro-anatomical relationship between anxiety and creativity, that is, to visualize

what happens in the brain when an anxious person performs verbal or graphic creative tasks. Nonetheless, the present investigation contributes data that help to better understand the relationships between anxiety and creativity.

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