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Prefrontal symptomatology and attentional profile as predictors of perceived stress and frustration tolerance in secondary students

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Abstract

Introduction. The objective of this study was to analyze the relationships between perceived stress, frustration tolerance, prefrontal symptomatology and attentional profile in students of secondary education.

Method. The study was designed with a nonexperimental, quantitative, cross-sectional and correlational methodology, with 91 participants between the ages of 12 and 15 (M = 13.88; SD = 1.89).

Results. The results indicated a tendency to greater perceived stress in students who presented an inattentive profile, greater prefrontal symptomatology and problems with social and emotional control. Higher scores in frustration tolerance were presented by those with less prefrontal symptomatology and fewer problems in executive, social and emotional control. The predictive capacity of prefrontal symptomatology was demonstrated in both perceived stress and frustration tolerance, and inattention was also a predictor of perceived stress in the sample analyzed.

Conclusions. In conclusion, these types of studies offer guidance to plan training interventions for coping with stress and frustration, as effective strategies for solving everyday problems.

Key words: Stress, frustration, prefrontal symptomatology, inattention, inhibitory control, adolescence

Resumen

Introducción. El objetivo de este estudio fue analizar las relaciones entre el estrés percibido, la tolerancia a la frustración, la sintomatología prefrontal y el perfil atencional en estudiantes de secundaria.

Método. Se diseñó un estudio de metodología no experimental, cuantitativo, transversal y correlacional en el que participaron 91 estudiantes de edades comprendidas entre 12 y 15 años (M = 13.88; DT = 1.89).

Resultados. Los resultados indicaron la tendencia a mayor estrés percibido en aquellos estudiantes que presentaban un perfil inatento, mayor sintomatología prefrontal y problemas de control social y emocional. En tolerancia a la frustración, puntuaron más alto aquellos con menor sintomatología prefrontal y menos problemas manifestados en el control ejecutivo, social y emocional. Tanto en estrés percibido, como en tolerancia a la frustración, se demostró la capacidad predictiva de la sintomatología prefrontal, siendo además la inatención un predictor del estrés percibido en la muestra analizada.

Conclusion. Como conclusión, este tipo de estudios orientan la programación de intervenciones basadas en el entrenamiento de habilidades de afrontamiento del estrés y de la frustración como estrategias eficaces para resolver problemas cotidianos.

Palabras clave: Estrés, frustración, sintomatología prefrontal, inatención, control inhibitorio, adolescencia.

Introduction

Adolescence is a stage of life where psychological adjustment is constantly being tested, both behaviorally and emotionally. This adjustment will determine the personal development and mental health of this population (Meilstrup et al., 2015; Plenty et al., 2014). It is a particularly vulnerable and critical period of brain development, characterized by emotional instability and prefrontal immaturity, where we may observe the involvement of certain impulsive, uncontrolled behaviors and risk-taking in choices made. This prefrontal immaturity is involved in some degree in behaviors that affect their sense of responsibility, impulsivity and attentional control (Pedrero-Pérez et al., 2019; Rueda, 2021; Soler et al., 2010). Adolescents have therefore been the object of psychological study in many investigations into the negative influence of psychological maladjustment in adaptation and emotional development (Valiente-Barroso et al., 2020a). Specifically, positive psychology has focused on developing positive strengths to promote behaviors that address well-being, satisfaction, and better quality of life, as a means toward mental health and subsequent functioning in adult life (Donahue et al., 2014; Jaworska & MacQueen, 2015; Kökönyei et al., 2015; Ordóñez et al., 2015; Seligman, 2014; Vásquez, 2013).

In the context of adolescents' psychological adjustment, one of the variables that significantly interferes in well-being and health is perceived stress. This stress has been defined as constant, daily concerns over academic, emotional and social factors. These daily concerns constitute a survival process, continuous adaptation, and they generate a multiplicity of emotions (Gázquez et al., 2015; Pérez-Fuentes et al., 2015; Pérez-Fuentes et al., 2016). The effects of stress have been shown to play a role in the later development of psychological disorders (Cortes, 2022). Everyday stress has been distinguished from chronic stress, where the former is what appears most often in certain situations, even daily. The person who experiences everyday stress is subject to irritability and feelings of frustration and helplessness. If this effect is cumulative, it may eventually have a harmful impact on both physical and mental health. While studies of stress in adolescents are still few in number, there have been many studies in recent years that offer evidence of relationships between academic stress and other variables such as academic achievement, scholastic learning, executive functioning and life satisfaction (Chraif, 2015; Martínez-Vicente et al., 2019; Mehmet & Watson, 2017; Suárez-Riveiro et al., 2020; Valiente-Barroso et al., 2020b; Veena & Shastri, 2016). In the field of education, stress is related to thoughts that somehow interfere and bring on significant emo-

tional, physiological, and behavioral sequelae in students. Students find themselves in the crossfire of too many demands within a context where they are often deficient in competence and self-control strategies (De la Fuente et al., 2015).

Everyday stressors have been identified in different spheres of life, defined mainly as school, social, family, and health. Examples of stressors include exams, learning difficulties, a heavy workload of school assignments and extracurricular activities, high standards required by parents, family instability, sickness, and preoccupation with one's body image (Valiente-Barroso et al., 2020). These are risk factors that threaten adequate personal development. The combination of several such factors has been shown to predict social-emotional adaptation and certain psychological disorders, becoming a potential cause of behavioral and emotional impairment, of inadequate bodily functioning, and of deficits in attention and concentration (Bruguera et al., 2017; Escobar et al., 2010; Johnson & Swendsen, 2015; Smith & Somhlaba, 2015). Consequently, a student's resources for coping with stress in the educational environment become especially important. These resources act as protectors and directly influence their capacity for coping and for solving problems. Among such resources we find self-esteem, motivation, self-perception of stress management, resilience, persistence and emotional intelligence; these become preventive measures against stress, and therefore, predictors of well-being and optimal health (Cabanach et al., 2013; Gázquez et al., 2015, 2016; Hodzic et al., 2016; Karaman et al., 2018; Peña et al., 2017; Sáinz et al., 2012).

Frustration tolerance is a person's resistance to situations that are adverse and stressful. It allows a person to not become blocked or overwhelmed, and to keep moving ahead despite the difficulties and obstacles that they find along the way (Oliva et al., 2011; Ventura-León et al., 2018). People with higher levels of stress tolerance have been shown to possess a broad range of personal resources that allow them to face unfavorable circumstances and find effective solutions. In such a scenario, they have enough optimism to respond to changes and to new experiences that occur in this stage of life, where they use self-efficacy skills to manage and to cope, not letting themselves be carried away by negative emotions, hopelessness or anxiety (Mustaca, 2018). In the pertinent scientific production, studies have addressed the relationship between low frustration tolerance and deficits in emotion regulation and certain psychopathological problems in adolescence (Denham et al., 2011; Perlman et al., 2014). Results have shown that skill in constructive, effective emotion regulation plays an essential role in impulse control when facing a task. Thus, persons with greater frustration tolerance report

less impulsivity, greater emotional self-regulation, higher levels of self-esteem, less anxiety, and they adapt better to stressful contexts. In addition to the foregoing, they also have better capacity for planning, for problem solving, and for adequate decision making (Ibañez et al., 2018; Jibeen, 2013; Valiente-Barroso et al., 2021).

Among the changes that take place during adolescence, there are those that relate to brain maturation (Bueno, 2022); myelination of the frontal lobe has especially important repercussions, reaching its peak in the third decade of the subject's life. It has been proven that part of the brain architecture continues to develop, and that the prefrontal cortex undergoes important changes after puberty. Magnetic resonance imaging has revealed late development or maturation in areas located in the prefrontal region, not culminating until early adulthood. During this period, the modeling of the brain is almost definitive, with a capacity to adapt to environmental circumstances similar to those experienced during adulthood (Oliva-Delgado, 2012). Moreover, development of limbic structures must also be considered, because they improve progressively in connection with the prefrontal lobe; together they represent a significant advance in cognitive, behavioral, inhibitory and emotional control. In this way, many automated emotional responses depend on and become controlled by the prefontal cortex, contributing to a decline in the impulsivity that characterizes preadolescents (Goldberg, 2001).

During adolescence, responses to certain stimuli or situations, especially novel ones, are produced through reticular and associative brain processing, where the prefrontal cortex is the area for higher-level integration. Disconnection between these brain areas is revealed in dissociated responses, with impulsive and emotional actions in situations where more rational responses with the intervention of the prefrontal cortex would be desirable. This is the case of risk situations in which responses are delayed, when flight or avoidance would be most favorable. Hence, the greater prefrontal activation and prolonged reaction times exhibited by adolescents, in comparison to adults, when faced with uncertainty in problem situations (Bair & Fugelsang, 2004; Eshel et al., 2007). The prefontal cortex has the function of coordinating and controlling activity in its cognitive, emotional, and behavioral dimensions. Among the different functions attributed to this area of the brain, we find attentional monitoring, problem solving, planning, executive control, working memory and emotion management (Ardila, 2008; Pedrero-Pérez et al., 2015). Impairment in these control systems is due to certain neurobiological causes, learning deficits, or the occurrence of events involving everyday errors that result

in the deterioration of these systems (Montenegro et al., 2013; Ruiz-Sánchez de León et al., 2010). There is evidence that these errors are due to executive failures in daily activities, more than in memory, and that they are associated with attentional management of prefrontal control, referred to as executive dysfunction. As explained in earlier studies, failures in attentional processes, decision making and management of emotions and behaviors cause an increase in stress (Cortes, 2022) that hinders correct prefrontal functioning (Arnsten, 2009; Lozoya-Delgado et al., 2012; Pedrero-Pérez & Ruiz-Sánchez de León, 2013; Pedrero-Pérez et al., 2013).

The immaturity of the prefrontal lobe brings greater vulnerability to failures in the cognitive process where working memory is required, but is not fully developed at this stage. It also plays a role in frequent perseverative errors in tasks where a previously learned rule must be adjusted to new circumstances. These limitations justify the behavioral rigidity and the incapacity to control and inhibit inadequate, irrelevant responses that depend on the prefontal cortex, such as selective and sustained attention, still undergoing development in the stage of adolescence (Bueno, 2022; León-Carrión et al., 2004; Oliva-Delgado, 2012). Studies to date have not documented a direct relationship between deficient prefrontal functioning and daily activities, even though frequent, daily failures originating in the prefrontal cortex are noted (Balogh et al., 2013; Blum et al., 2015). Some studies concur in emphasizing the role that this area of the brain plays in behavior, where a loss of behavioral control is closely linked to prefrontal dysfunction, in which executive functions would be involved. Deficits in these functions hinder regulation of higher behavior-control mechanisms, and their consequences can be seen in errors in daily activities (Elhai et al., 2017; Everitt & Robbins, 2016; Korponay et al., 2017; Pedrero-Pérez et al., 2019).

Differences in selective and sustained attention, inhibition, and planning ability have been previously demonstrated in people with and without subjective memory complaints, in which executive functions and prefrontal symptomatology may exert a mediating role between these complaints and perceived stress (Molina-Rodríguez et al., 2018; Pedrero-Pérez et al., 2013; Ruiz-Sánchez de León et al., 2010; Ruiz-Sánchez de León et al., 2014). These persons with attentional and executive deficits have a greater tendency to present more prefrontal symptomatology. They present symptoms attributed to healthy persons, with no neurological and/or clinical neuropsychological diagnosis, and are characterized by having impulsive, uninhibited behaviors, inattention problems and deficient action plans. Consequently, they are

unable to monitor or generate different alternatives when facing a problem (Lozoya et al., 2012; Ruiz-Sánchez de León et al., 2014).

An inattentive neuropsychological profile, with prefrontal symptomatology, can be a determinant in mental health, revealing itself through cognitive complaints, perceived stress and lack of coping ability. It has been demonstrated that those with poorer memory and poorer executive and attentional skills may have difficulties adapting to changes because of their poor stress management; when perceived stress increases, attentional deficits increase, and are visible in everyday errors and absent-mindedness (Ruiz-Sánchez de León et al., 2014). When a stressor is perceived as such, a set of skills are put into function to address the problem, and suitable cognitive abilities are required to do so (Liston et al., 2006; Lozoya et al., 2012; Ruiz-Sánchez de León et al., 2010).

Objectives and hypotheses

Based on the foregoing, the general aim of the present study was to analyze the relationships between perceived stress, frustration tolerance, prefrontal symptomatology and attentional profile, in students of compulsory secondary education. In this regard, significant differences are expected to be found in the variables of prefrontal symptomatology and attentional profile, depending on the different levels of perceived stress and frustration tolerance. In addition, the predictive value of the variables of prefrontal symptomatology and attentional profile in both perceived stress and in frustration tolerance in an adolescent population will be analyzed.

Method

Participants

The selected sample was obtained through non-probabilistic, incidental convenience sampling. This non-clinical population was initially formed by 126 secondary students enrolled in one secondary school in the autonomous region of Madrid. Participants were excluded who presented ADHD or any specific learning disorder, for example, associated with reading and writing, because these disorders are related to the maturity of the prefrontal cortex. Finally, after applying the exclusion criteria, the sample contained 91 students who were enrolled in 7th grade (n = 25; 60.43 %) or 8th grade (n = 51; 39.57 %). Of this group, 39 were boys (42.85 %) and 52 were girls (57.15 %); their ages fell between 12 and 15 years old (*M* =

13.88; *SD* = 1.89). Inclusion criteria considered the students present in the classroom on the day the questionnaires were administered, and their previous submission of the consent form signed by their families. Students who did not meet these criteria were excluded from the study.

Instruments

The Perceived Stress Scale, PSS-14 (Cohen et al., 1983), Spanish translation by Remor and Carrobles (2001), is a test made up of 14 items with 5 Likert options ranging from 0 (never) to 4 (always), producing a total score between 0 (minimum perceived stress) and 56 (maximum perceived stress). The scale assesses the degree of subjective control in unpredictable or unexpected situations, and the stress caused by the absence of perceived control, thereby providing a global measure of perceived stress in the person being assessed. Adequate internal consistency (.81) was measured using the Cronbach alpha coefficient.

Escala para la Evaluación de la Tolerancia a la Frustración [Frustration Tolerance Scale]. This Spanish version (Oliva et al., 2011) is based on the Stress Management subscale of the Emotional Quotient Inventory- Youth Version (Bar-On & Parker, 2000), and contains 8 items. Responses are expressed in a Likert scale and range from 1 to 5 (Never; Seldom; Sometimes; Often; Always). This test measures the ability to manage and bear with adverse and stressful situations, as well as to control one's impulses. The questionnaire yielded adequate internal consistency with a Cronbach alpha coefficient of 0.77.

Inventario de Síntomas Prefrontales Abreviado (ISP-20) [Short Inventory of Prefrontal Symptoms] (Pedrero-Pérez et al., 2015). This scale contains 20 items with five Likert-type responses from 1 (never or almost never) to 5 (always or almost always). Information is collected on executive control, social control and emotional control, as well as a sum total score called "prefrontal symptomatology". In all scales, high scores indicate the presence of problems. This instrument presents adequate psychometric properties, both in validity and reliability, with convergent and divergent validity demonstrated previously using objective neuropsychological measures. Exploratory analysis yielded three factors that explained 71.52% of the total variance, as well as internal consistency of the inventory as a whole, with a Cronbach alpha of .86 (Pedrero-Pérez et al., 2015). For the current study, internal consistency was adequate, at .83 (Cronbach alpha).

Test de Evaluación Neuropsicológica mediante realidad virtual [Neuropsychological Assessment using virtual reality] NESPLORA-Classroom (Climent & Banterla, 2010). This test is based on the cognitive dynamic of the *Continuous Performance Test* (CPT, Conners, 1995), initially designed to assess attentional processes and thereby diagnose any associated disorder. A special headset equipped with movement sensors and earphones presents a virtual environment, similar to a classroom, where the student is seated at one of the desks. The software updates the perspective according to the subject's head movements, giving them the sensation of being in the classroom. Different stimuli are presented through the virtual blackboard and the earphones, and the subject must respond according to instructions given. The test is made up of two assessment exercises. In the first, the subject must push the button each time the stimulus presented is different from the target stimulus; in the second, they must push the button whenever they hear or see the target stimulus. The following measurement indices are considered:

-Selective, focused inattention, measured by number of omission errors;

-Inhibitory control, measured by the number of commission errors that are interpreted as a lack of response inhibition or motor control;

-Attentional capacity, measured by reaction time and number of correct answers on the test; this offers a reliable measurement of processing speed and response consistency;

-Total motor activity, including improductive instances, referring to the subject's head movements while executing the task, even when these are unnecessary.

The test is adaptive, because the frequency of the stimuli and the length of their presentation time depends on the subject's responses, thereby improving the test's real efficacy and ecological validity. Although this makes reliability harder to measure, reliability of each scale falls between .963 and .981 (Cronbach alpha).

Procedure

Once the school administrators and families had been informed and their authorization and consent granted, we administered the questionnaires on perceived stress, frustration tolerance and prefrontal symptomatology. These tests were administered collectively to all the students in one class session (approximate sixty-minute duration), always in the presence of the classroom teacher and one of research team members, who was also part of the school's faculty. On the other hand, the *NESPLORA-Classroom* instrument was applied individually. To do so, each participant was isolated in a room free of potentially distorting sound stimuli. The software was implemented with the help of appropriately trained personnel, made up of a

group of seven school psychologists. In no instance were other participants allowed to be present, in order to avoid any practice effect.

Anonymity and confidentiality of the obtained results were guaranteed at all times, as well as voluntary participation, in order to reduce biased responses that would compromise the following analysis and validity of the obtained results.

Data analyses

The study was approached from a non-experimental, quantitative methodology that was cross-sectional and correlational. Data analyses were performed using IBM SPSS, version 25.0 for Windows. Descriptive statistics were calculated, and not all the variables met normality criteria. We therefore opted for non-parametric tests, analyzing variable correlations using Spearman's Rho coefficient. Given the small size of the groups to be compared, robust means comparison tests (Brown-Forsythe) were performed, calculating post hoc contrasts with the Scheffé correction test, significance value of .05, and Cohen's *d* statistic to estimate the effect size of the differences. In order to perform differential analyses, perceived stress and frustration tolerance were taken as independent variables, and the factors of prefrontal symptomatology and attentional profile as dependent variables. Three groups of each independent variable were established, using the previously calculated percentiles of 33 and 66: low level (percentiles below 33), medium level (percentiles between 33 and 66, inclusive) and high level (percentiles above 66). Finally, two stepwise linear regression analyses were carried out to determine the predictive value of the variables linked to prefrontal symptomatology and attentional profile on participants' perceived stress and frustration tolerance.

Results

Descriptive and correlational analyses

Results of the descriptive and correlational analyses are shown in Tables 1 and 2, respectively. According to these results, positive, statistically significant relationships were observed between perceived stress and the variables of prefrontal symptomatology, social control, emotional control, inattention and motor activity. In addition, negative, statistically significant relationships were found between frustration tolerance and the variables of prefrontal symptomatology, executive control, social control, emotional control, and motor activity.

Table 1. *Descriptive statistics of the study variables.*

	M	*SD*	*Sk*	*Ku*	*Min.*	*Max.*	*z*	*p*
Perceived stress	24.88	8.55	.20	-.31	6	44	.88	.42
Frustration tolerance	28.07	5.51	-.31	-.65	16	38	1.04	.22
Prefrontal symptomatology	41.89	13.07	.56	1.31	12	91	.71	.68
Executive control	19.02	11.47	.49	-.41	4	54	.97	.29
Social control	7.88	4.12	.61	-.16	0	18	1.11	.16
Emotional control	15.16	9.45	.80	-.40	1	38	1.59	.01
Inattention	15.75	22.39	2.37	5.25	0	108	2.36	< .001
Inhibitory control	8.90	15.63	7.63	65.99	0	145	2.70	< .001
Attentional capacity	817.48	118.23	.13	-.49	571.72	1080.61	.54	.92
Motor activity	.45	.39	1.67	.27	.04	2.05	.18	.002

Note. *M*= Mean; *SD*= Standard Deviation; *Sk*= skewness; *Ku*= kurtosis; *Min*.= minimum score; *Max*.= maximum score; *z* = Kolgomorov-Smirnov test

Table 2. *Correlations between study variables*

	1	2	3	4	5	6	7	8	9	10
Perceived stress (1)	-									
Frustration tolerance (2)	-.55**	-								
Prefrontal symptomatology (3)	.55**	-.64**	-							
Executive control (4)	.09	-.25**	.39**	-						
Social control (5)	.46**	-.50**	.74**	-.04	-					
Emotional control (6)	.42**	-.31**	.49**	-.53**	.58**	-				
Inattention (7)	.37**	-.18	.12	.05	.02	.04	-			
Inhibitory control (8)	.12	-.11	.13	-.08	.04	.21*	-.22*	-		
Attentional capacity (9)	.20	-.03	.01	-.03	.05	-.03	.50**	-.15	-	
Motor activity (10)	.35**	-.25*	-.26*	-.01	.11	.21	.33**	.33**	.08	-

*p<.05; **p<.01

Differential analysis

First, scores in prefrontal symptomatology and attentional profile were compared according to previously established levels of stress. Results as shown in Table 3 indicated significant differences between students with low stress and students with high stress in prefrontal symptomatology, social control, emotional control, and inattention. In addition, significant differences were observed between the medium- and high-level groups of perceived stress, in prefrontal symptomatology and social control.

Table 3. *Robust test of differences of means between the different groups of perceived stress*

Perceived stress	Low level (n=35)	Medium level (n=28)	High level (n=28)	*Brown-Forsythe*	*Post Hoc*	*d*
Prefrontal sympto-matology	35.21(8.75)	41.74(12.01)	50.37(14.20)	11.92***	1-3***	-1.28
					2-3**	-.65
Executive control	16.21(8.48)	21.40(11.59)	19.92(14.15)	1.58		
Social control	6.48(3.11)	6.96(3.09)	10.66(4.82)	10.32***	1-3***	-1.03
					2-3**	-.91
Emotional control	12.51(7.57)	13.88(8.24)	19.77(11.24)	5.00**	1-3*	-.75
Inattention	6.60(8.26)	14.63(19.77)	28.11(31.07)	6.89**	1-3**	-.94
Inhibitory control	6.1(4.95)	7.88(6.36)	8.30(.32)	1.08		
Attentional capacity	795.65(105.49)	814.45(108.00)	848.30(142.66)	1.39		
Motor activity	.35(.37)	.44(.32)	.59(.47)	2.72		

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

Second, scores in prefrontal symptomatology and attentional profile were compared according to (low, medium, high) levels of frustration tolerance. Results as shown in Table 4 indicated significant differences between the groups of low and high frustration tolerance in prefrontal symptomatology, social control, and emotional control, and between the low and medium groups in prefrontal symptomatology and social control.

Table 4. *Robust test of differences of means between the frustration tolerance groups*

Frustration tolerance	Low level (n=29)	Medium level (n=35)	High level (n=26)	*Brown-Forsythe*	*Post Hoc*	*d*
Prefrontal sympto-matology	50.93(14.26)	40.17(10.99)	33.76(6.66)	16.99***	1-2**	.84
					1-3***	1.54
Executive control	22.24(13.50)	17.94(11.35)	16.76(8.23)	75.99		
Social control	10.34(4.37)	7.50(3.94)	5.56(2.16)	72.60***	1-2*	.68
					1-3***	1.38
Emotional control	18.34(10.3)	15.18(9.72)	11.44(6.46)	78.14*	1-3*	.80
Inattention	22.73(30.73)	12.94(15.45)	11.32(16.96)	60.03		
Inhibitory control	7.66(5.14)	11.91(24.17)	6.16(4.89)	40.73		
Attentional capacity	809.15(130.98)	832.47(117.24)	806.49(105.32)	83.75		
Motor activity	.46(.35)	.48(.44)	.36(.37)	85.42		

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

Multiple regression analysis

To understand the effect of the different study variables on students' perceived stress, a linear regression analysis was performed, with measures of prefrontal symptomatology and attentional profile as predictive variables (Table 5). Results indicated that the variables pre-

frontal symptomatology, inattention and emotional control, in conjunction, had predictive capacity on perceived stress, explaining 36.2% of the total variance.

Table 5. *Results from the regression analysis with perceived stress as criterion variable and prefrontal symptomatology and attentional profile as predictive variables.*

	R	R^2	adjusted R^2	Durbin-Watson	*F*(df)	*p*	*B*	*Std. Error*	*β*	*t*
Model 1	.514	.264	.255		29.74(1,84)	<.001				
Prefrontal symptomatology							.33	.06	.51	.45***
Model 2	.592	.351	.335		22.16(2,84)	<.001				
Prefrontal symptomatology							.30	.06	.47	5.19***
Inattention							.11	.03	.29	3.31**
Model 3	.620	.385	.362	1.85	16.88(3,84)	<.001				
Prefrontal symptomatology							.25	.06	.39	3.99***
Inattention							.11	.03	.29	3.31**
Emotional control							.18	.09	.19	2.11*

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

Finally, a second linear regression analysis was conducted with the measures of prefrontal symptomatology and attentional profile as predictive variables, and frustration tolerance as the criterion variable. The results shown in Table 6 indicated that, in our study sample, the predictive capacity of prefrontal symptomatology alone explained 34.2% of the total variance of frustration tolerance.

Table 6. *Results of the regression analysis with frustration tolerance as criterion variable and prefrontal symptomatology and attentional profile as predictive variables.*

	R	R^2	adjusted R^2	Durbin-Watson	*F*(df)	*p*	*B*	*Std. Error*	*β*	*t*
Prefrontal symptomatology	.591	.350	.342	1.53	45.16(1,84)	<.001	-.24	.03	-.59	-6.72***

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

Discussion and Conclusions

Within the web of variables involved in the personal, cognitive, social and affective development of students in adolescence, some, such as those included in this study, are cru-

cial for well-being and positive mental health. Because of the need to contribute empirical evidence on the direct relationships and reciprocal influence of psychological variables in students' well-being, which would support later interventions within the educational context, the aim of this study was to analyze the relationships between perceived stress, frustration tolerance, prefrontal symptomatology and attentional profile in students of secondary education.

First, we confirmed the tendency for students to present greater perceived stress when they manifest greater difficulties associated with prefrontal symptomatology, and these greater difficulties tend toward a greater presence of factors associated with the problems of social control and emotional control. Moreover, those who report greater perceived stress are the ones who present greater problems with inattention and improductive motor activity while performing the task. Concerning frustration tolerance, it is revealing that students with the lowest levels are precisely those who report greater prefrontal symptomatology, so often associated with problems of executive control, social control and emotional control, as well as improductive motor activity on a task. Conclusions are drawn along the lines of preceding studies mentioned above, where relationships were established between the perceived stress in students with greater attention and concentration problems, and the presence of emotional and behavioral problems (Bruguera et al., 2017; Johnson & Swendsen, 2015; Smith & Somhlaba, 2015). The same is confirmed with frustration, because greater tolerance tends toward greater emotional control and less impulsivity, as earlier studies have reported (Ibañez et al., 2018; Jibeen, 2013; Mustaca, 2018; Perlman et al., 2014). The importance of coping strategies in problem solving is therefore reaffirmed; in adolescents, coping strategies act simultaneously as a protective and preventive measure against stress and avoidance of the continuous frustrations (Gázquez et al., 2015, 2016; Hodzic et al., 2016; Karaman et al., 2018; Peña et al., 2017).

On the other hand, the predictive nature of prefrontal symptomatology in students' perceived stress and in frustration tolerance is also confirmed, with inattention and emotional control problems also predictive of perceived stress. These results are significant if we consider that the prefrontal cortex acts to inhibit certain behaviors and emotions, influencing the psychological and mental health of this part of the population. Consequently, they are in line with previous studies claiming that prefrontal symptomatology, attentional deficits, inattention, and impulsivity give rise to psychological impairment that is revealed in stress and the

inability to cope with adverse situations (Lozoya et al., 2012; Pedrero-Pérez et al., 2013; Ruiz-Sánchez de León et al., 2014). Although we cannot draw conclusions of a causal nature due to the nature of the present study, our obtained results are significant and meaningful because they make a positive contribution to our understanding of the strengths, and of certain limitations, that are typical of adolescence.

This study is not free from limitations. One of these is the small sample size, from a single school, between the ages of 12 and 16, so that the results and conclusions cannot be generalized or extrapolated to a broader population. In addition, the use of self-reports as assessment instruments can color the results with subjectivity due to the social desirability effect, even though these instruments are of value because their reliability and validity have been previously established in educational contexts where this type of test is the most suitable for collecting information. Self-report questionnaires have been shown to be an essential, additional complement in assessments, as they provide relevant information on cognitive, emotional and behavioral symptomatology (Pedrero-Pérez & Ruiz-Sánchez de León, 2019), and as a means to rule out the possibility of more serious problems. On the other hand, the cross-sectional nature of the study limits the interpretation of the results and does not allow us to identify cause-effect relations, or to understand how these variables evolve over time. A longitudinal design would give more weight to these conclusions and would allow us to specify the directionality of the relationships between perceived stress, frustration tolerance, prefrontal symptomatology, and the attentional processes of students in any stage of education. Finally, another limitation is the scarcity of studies to date that include the variables put forward in this study. This in turn is a strength of the present study, because its results lay a foundation for further work devoted to evaluating the reciprocal influence between cognitive variables and psychological variables in adolescents. The empirical evidence that is demonstrated in these studies has documented that inattentive adolescents or adolescents with attention deficits can suffer from stress and greater frustration in everyday events. It would be interesting and necessary to include other variables such as self-concept, emotional intelligence, or resilience, because they may have a mediating effect on the relationships described.

In conclusion, this investigation provides useful information for detecting and being alert to possible emotional or psychological maladjustment in the educational context which may be affecting the well-being of adolescents. It therefore offers guidance for planning interventions --whether cognitive, psychological, affective, social-- that involve training in

skills for coping with stress and frustration, as effective strategies for solving everyday problems in a non-clinical population. In this way, we seek to avoid the impact of negative variables on personal and psychological well-being, and ultimately, on mental health.

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