Full Length Research

Relationships between anxiety and aggression in a national sample of Portuguese youth: a moderated-mediation model of long-term and short-term self-regulation by internal resources for resilience, gender, and age

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College students' need for mental health care has increased dramatically and this has led to the investigation of this study. A national self-administered questionnaire was carried out among young people in Portugal, between the ages of 18 and 35, with the aim to increase knowledge about the relationship between anxiety, aggression, both long-term and short-term self-regulation, and resilience; to examine relationship between anxiety and aggression partially mediated by short-term and long-term self-regulation, with the moderation of resilience; and also to analyze the moderation of resilience and a sociodemographic variable, i.e., gender and age, in the multiple partial mediation of long-term and short-term self-regulation in the relationship between anxiety and aggression among Portuguese youth. A regression-based moderated-mediation model was developed, following the indications by Hayes (2018). Results indicated that both anxiety and aggression decreased with high long-term self-regulation and with positive development of resilience. Gender and age differences were observed. Regarding gender differences, this interaction presented a significant effect on short-term self-regulation among men, while no significant results were observed among women. Concerning age differences, the effect of the interaction anxiety x resilience was stronger in participants aged 18-20 than in 21-23 age cohort, while no significant effect was observed in the older age cohort, 24-35 years. Discussion suggested the need to integrate the prevention and promotion paradigms to foster healthy development in colleges, as well as highlighting the importance of taking into account self-regulation and resilience skills in intervention program design.

Key words: Anxiety, Aggression, Self-regulation, Resilience, University students

Introduction

College students' need for mental health care has increased dramatically. The transition to adulthood involves the development process, during which period-specific problems emerge along with the developmental outcomes experienced by an individual in the early periods of life. While this period is experienced more healthily by some adults, others may experience problems in many fields, especially in terms of psychological symptoms (i.e. anxiety and aggression) (Nogueira, 2016; Reis, Ramiro, Gomez-Baya, & Matos,

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2018; Schleider, Abel, & Weisz, 2015).

Anxiety and aggression are essential traits to optimally cope with environmental challenges and trigger adaptive responses (Pollak, 2015). However, in their exaggerated form, i.e., if anxiety-like and aggressive behavior occur out of context and control, they are often associated with psychopathologies like generalized anxiety disorders, phobias, depression and antisocial personality disorder (Bayram & Bilgel, 2008; Marshall, Arnold, Rolon-Arroyo & Griffith, 2015; Matos et al., 2008; Sih, 2011). Concerning the environment, adverse experiences, especially during early phases in life, have been studied extensively. Regarding anxiety, mainly anxiogenic effects have been found; i.e., childhood maltreatment leads to an increase in anxiety disorders and heightened depression risk in humans (Hovens et al., 2010; Ishikawa, Nishimura, & Ishikawa, 2015; Marshall et al., 2015; Matos et al., 2008; Pollak, 2015). Considering the effect of environmental factors during early phases in life on aggression, childhood adversity frequently leads to higher expression of aggressive behavior in later life (Carver, Johnson, McCullough, Forster, & Joormann, 2014; Haller, Harold, Sandi, & Neumann, 2014; Provençal, Booji, & Tremblay, 2015).

According to different researches, the effects of negative or traumatic experiences during childhood are often emphasized as among the causes of emotional problems during one's adulthood. These experiences, regardless of which period they are experienced in, are experiences that have a series of short- or long-term irremediable effects in that exceed individuals' coping skills and also because these experiences disturb an individual peace of mind, decrease his/her self-regulation and resilience, and make them more susceptible to psychological disorders (Carver et al., 2014; Provençal et al., 2015).

Over the last few years, adolescence emerged as another possible sensitive period in which the behavior of an individual can be shaped (Marshall et al., 2015; Matos et al., 2008). Adolescence is marked as the gradual transition from childhood to adulthood and comprises the time around puberty (sexual maturation), but is not limited to it (Matos et al., 2008). There are some indications that both anxiety and aggression can be modulated in this period. For example, adverse life events during adolescence lead to higher levels of anxiety and aggression in humans (Cummings, Caporino, Nicole, Kendall, & Philip, 2014; Hennessy, Kaiser, Tiedtke, & Sachser, 2015; Tsoory, Cohen, & Richter-Levin, 2007). Another example of one adverse life event during adolescence and the transition to adulthood,which can effectively cause high levels of anxiety and aggression,is entering the university (Nogueira, 2016; Reis et al., 2018). In analyzing the outcomes of childhood or adolescence negative experiences during adulthood, one study concluded that while not all individuals experience the same consequences, some factors may decrease or increase the effect of negative or traumatic experiences of individuals (DiGangi, Guffanti, McLaughlin, & Koenen, 2013). These factors are considered as protective and risk factors. Risk factors increase the impact of a traumatic event, whereas protective factors reduce such effects and increase a person's ability to recover (Matos et al., 2008).

In addition, support systems, self-esteem, self-regulation and resilience level in adults play an important role in the process of adaptation and coping with the negative influence of early-period negative or traumatic experiences. Considered as a protective factor in terms of negative or traumatic experiences, self-regulation is the ability to monitor and manage emotions, thoughts, and behaviors in ways that are acceptable and produce positive results such as well-being, healthy relationships, and learning. It is how we deal with stressors that lays the foundation for all other activities. Developing this ability requires self-awareness, emotional intelligence, efficient filtering of sensory stimulation, coping effectively with stress, relating well to others, and sustaining focus (Gomez-Baya, Mendoza, Paino & Matos, 2017). The ability to self-regulate has been viewed as a desirable quality throughout history because of its positive effects on behavior and the acquisition of skills (Zimmerman, 2001). Resilience is considered as a protective factor in terms of negative or traumatic experiences, and it is a concept that indicates the skill of overcoming difficulties and stressful situations and the power of surviving despite all environmental negativities (Simões, Matos, & Morgan, 2015).

More recently self-regulation has been proposed as an important pathway to positive youth development (Matos, Santos, & Reis, 2017), which may help to prevent adolescents from engaging in risky behaviors (Simões et al., 2015). High levels of self-regulation are associated with positive behavior, including prosocial behavior and academic achievement, while low levels are related to more externalizing and internalizing problem behavior in adolescence (Matos et al., 2008; Matos, Gaspar, Cruz, & Neves, 2013). Thus, self-regulation and resilience are associated structures in that self-regulation and resilience help reduce the effects of negative life events with its features of controlling stress and helping an individual cope with stressful situations rather than avoid them. Recently, Matos, Santos, Reis and Marques (2018) concluded that the promotion of positive youth and self-regulation may be relevant for fostering healthy life-style behaviors in Portuguese youth. In the study conducted by Simões and collaborators (2015), self-regulation was found to be a resilience factor in buffering youth from the negative influence of peer deviance for preventing the development of antisocial behaviors.

And there are several studies that mention the differences between gender and age regarding anxiety,

aggression, self-regulation and resilience (Gomez-Baya, Tomé, Reis, & Matos, *submitted*; Gomez-Baya, Mendoza, Paino & Matos, 2017, Pollak, 2015; Schleider, Abel, & Weisz, 2015).

The present study was carried out using university students, in different regions of Portugal, in order to allow for a representative sample of Portuguese youth in terms of healthy lifestyle behaviors. For the purpose of the present study the promotion of mental health studied was a) to increase knowledge about the relationship between anxiety, aggression, both long-term and short-term self-regulation, and resilience; b) to examine the relationship between anxiety and aggressionpartially mediated by short-term and long-term self-regulation, with the moderation of resilience; and c) to analyze the moderation of resilience and a sociodemographic variable, i.e., gender and age, in the multiple partial mediations of long-term and short-term self-regulation in the relationship between anxiety and aggression in Portuguese youth.

Materials and Method

The present national study is a part of the local national survey Health Behaviour in School-aged Children (HBSC/WHO) extended to Portuguese University Youth (Jovens Universitários Portugueses)- HBSC/JUnP, aiming to address health behaviours in these population (Reis, Matos & Equipa Aventura Social, 2017). Data collection was performed through an online survey, using the *Limesurvey* platform. The HBSC/JUnP followed all the rules for research outlined in the Declaration of Helsinki and was approved by the Ethics Commission of the Medicine Academic Center of Lisbon (Centro Académico de Medicina de Lisboa), CHLN/FMUL/IMM (Centro Hospitalar Lisboa Norte/Faculdade de Medicina de Lisboa/Instituto de Medicina Molecular). Confidentiality was ensured with anonymous response to the questionnaire and access restricted to the research team members, regarding the work on computing and data analyses. These procedures are also in agreement with the international standard guidelines from the HBSC/WHO survey protocol (Currie et al., 2010).
The study provides national representative data of 2991Portuguese young people, between 18 and 35 years old, randomly chosen from those attending university during the academic year of 2015/2016. Data was collected through a self-administered questionnaire. The sample was stratified by region (North, Center, Lisbon and Tagus Valley, Alentejo, Algarve, Madeira and the Azores). The sample included 2991 young people with an average age of 22 years old and the majority is of Portuguese nationality (95.9%). Most of the participants are female (73.7%) and single (92.3%).

Measures

Anxiety (Stay-T)

This subscale evaluates the degree of trait anxiety and it is one of two subscales created by Spielberg (1983) to assess anxiety. The version used was adapted, translated and standardized for the Portuguese population by Silva (2003) and consists of 20 items. Responses are scored on a 4-point Likert scale ranging from 1 = "Almost never" to 4 = "Almost always" and items 1, 3, 6, 7, 10, 13, 14, 16 and 19 need to be recorded. The total score can vary from 20 to 80 points, with the highest value as an indicator of greater anxiety.

Aggression (Buss & Perry)

This variable was assessed by the Buss-Perry aggression questionnaire, the version of the instrument used in the present study comprises elements of two Portuguese translations of the scale (Simões, 1993; Cunha & Gonçalves, 2012), thus seeking consistency in the translation of the same. In this context, a translation of the original version, subsequent retroversion (carried out by two Portuguese natives fluent in English) and the translation of the retroversion were carried out, and finally, the translated versionwas comparedto the original version. The scale consists of 29 items and 4 subscales - physical aggression (9 items), verbal aggression (5 items), anger (8 items) and hostility (7 items). The answers to each item are scored on a 5-point Likert scale, ranging from 1 = "totally false" to 5 = "totally true". The totals of the different subscales are obtained through the average of the items that make up each subscale and the total score is obtained from the sum of the 29 items, with the highest value as an indicator of greater physical aggression, greater verbal aggression, more anger and greater hostility.

Resilience

This concept was assessed by the Portuguese version (Martins, 2005; Simões, Matos & Morgan, 2015) of the Healthy Kids Resilience Assessment Module (v.6) (Constantine & Benard, 2001), of the California Healthy Kids Survey (CHKS, 2000). In the present report,subscalewas only used for internal resources. This subscale is composed of six dimensions, i.e., empathy, problem-solving, self-efficacy, cooperation/communication, self-awareness, and goals/aspirations (Constantine et al., 1999). Responses were answered with a 4-point scale (1=Not at all true; 4=Very much true); the scale ranges from 18 to 72, and higher scores indicate higher levels of competence, protection and resilience in facing adversity (Martins, 2005, 2007).

Self-regulation

This variable was assessed by the Portuguese version (Dias et al., 2014) of The Adolescent Self-Regulatory Inventory-ASRI (Moilanen, 2007). This is a theoretically-based questionnaire that comprises two temporal aspects of self-regulation, i.e., short and long term self-regulation. The original scale was adapted to the Portuguese context and new items were tested and included, resulting in the questionnaire ASRI-2 with 43 items (19 for short-term self-regulation and 24 for long-term self-regulation). Respondents rate how true each item was for them, on a 5-point Likert scale, ranging from 1 (not at all true for me) to 5 (really true for me).

Data analysis

Data from *Limesurvey* was transferred to an electronic data file. All variables were checked for data inaccuracy by running SPSS frequencies, and afterward, an analysis of missing values was conducted. The data were analyzed using the Statistical Package for Social Sciences 21.0 (SPSS). First, descriptive statistics were examined for the variables understudy (i.e., anxiety, aggression, self-regulation and resilience). Gender and age differences were analyzed by conducting t-tests and variance analyses, respectively. Second, zero-order Pearson correlations were performed to study the associations between variables. Third, a hierarchical regression analysis was conducted in order to explain aggression based on demographics, anxiety, self-regulation and resilience. Three steps were carried out and explained variance was increased systematically. Fourth, moderated-mediation models were developed in order to test: a) the relationships between anxiety and aggression; b) the partial mediation of both long-term and short-term self-regulation in this relationship; c) the moderation of resilience and gender/age in all the paths of the model. Figure 1 shows the moderated-mediation model. Process v3.1 SPSS macro (Hayes, 2018), based on regression analyses, was used. Model 59 was implemented for multiple partial mediations of both short-term and long-term self-regulation and moderation of resilience. Furthermore, model 73 tested the same multiple partial mediations with two moderators, i.e., resilience and gender/age. Three age groups were created, 18-20, 21-23 and 24-35, to examine moderations. In these models, 5000 bootstrap samples were estimated for bias-corrected bootstrap 95% confidence intervals, and Huber-White heteroscedasticity-consistent inference was analyzed. Preacher and Kelley (2011) recommendations were followed for model development and results' interpretation. Total effect model (i.e., the isolated relationship between anxiety and aggression) and direct effect model (i.e., the relationship between anxiety and aggression after including short-term and long-term self-regulation types as partial mediators, as well as resilience and gender/age as moderators) were contrasted. In these analyses, F statistics, R^2 values, effect coefficients and indirect effects were reported.

Results

Descriptive statistics, differences by gender and age and bivariate correlations

Table 1 shows descriptive statistics of variables under study, i.e., anxiety, aggression, both long-term and short-term self-regulation, and resilience. Significant gender differences were observed in long-term self-regulation, $t(2989) = -8.45$, $p < .001$, $md = -4.47$, short-term self-regulation, $t(2989) = -2.03$, $p = .042$, $md = -0.79$, and resilience, $t(2989) = -5.56$, $p < .001$, $md = -1.86$, with women presenting higher scores than men. No differences were found in anxiety, $t(2989) = -.07$, $p = .948$, nor aggression, $t(2989) = 1.42$, $p = .155$. Concerning differences by age, no differences were detected in anxiety, $F(2, 2988) = 2.34$, $p = .097$, in aggression, $F(2, 2988) = 1.98$, $p = .139$, long-term self-regulation, $F(2, 2988) = .39$, $p = .679$, short-term self-regulation, $F(2, 2988) = 1.52$, $p = .219$, and resilience, $F(2, 2988) = .91$, $p = .404$.

Furthermore, bivariate correlations showed that anxiety was positively associated with aggression. Anxiety and aggression were negatively related to (both long-term and short-term) self-regulation and resilience. Aggression was more strongly related to short-term self-regulation than inthe long-term type. Finally, self-regulation was positively associated with resilience, with greater effect in the case of the long-term type.

Hierarchical regression analysis

Table 2 shows the results of hierarchical regression analysis. Step 1 indicated no significant effect on aggression by gender and age. Step 2 showed an increase in explaining variance after including anxiety, which presented a moderate positive effect. Finally, after adding self-regulation and resilience in Step 3, an increase in the explained variance of aggression was found. Short-term self-regulation presented a moderate negative effect on aggression, while long-term self-regulation had a positive one. Resilience showed a small negative effect on aggression.

Moderated-mediation analyses

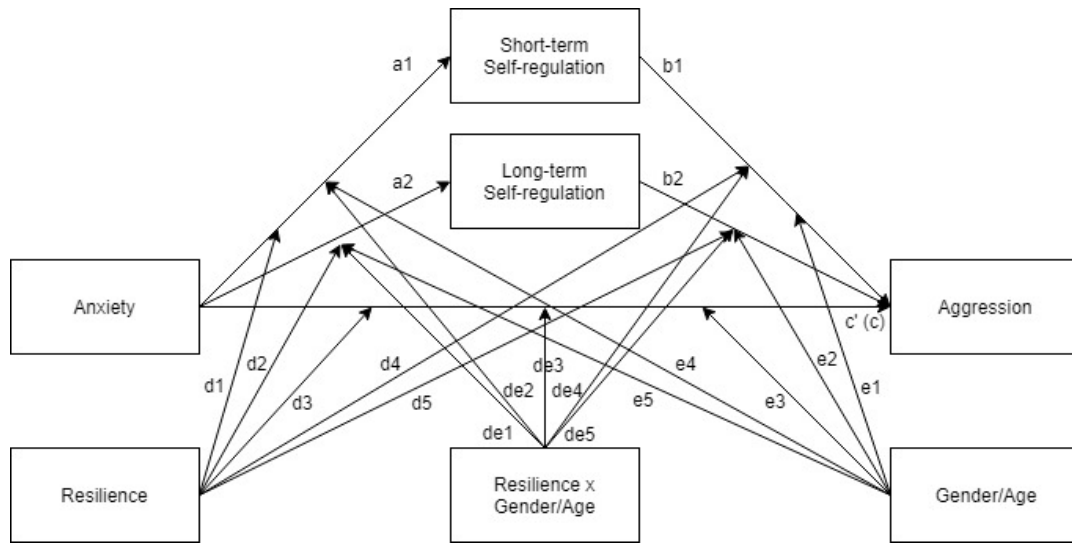Table 3 shows the coefficients of the moderated-

Figure 1: Moderated-mediation model of the relationships between anxiety and aggressiveness, through self-regulation by resilience and gender/age.

Table 1: Descriptive statistics and bivariate correlations

Variables	Total sample		Men		Women		Correlations				
	M	*SD*	*M*	*SD*	*M*	*SD*	1	2	3	4	5
1.- Anxiety	44.58	9.28	44.56	9.37	44.58	9.25	1				
2.- Aggressiveness	57.14	16.62	57.86	17.75	56.88	16.20	.31***	1			
3.- Long-term self-regulation	84.12	12.90	80.82	12.40	85.29	12.88	-.41***	-.04*	1		
4.- Short-term self-regulation	59.82	9.34	59.24	9.41	60.03	9.31	-.49***	-.35***	.40***	1	
5.- Resilience	55.49	8.10	54.12	8.05	55.98	8.06	-.40***	-.15***	.44***	.30***	1

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

mediation models tested. Model A examined how the relationship between anxiety and aggression was partially mediated by short-term and long-term self-regulation, with the moderation of resilience. First, results showed that anxiety presented a negative effect on long-term self-regulation, while resilience presented a positive one, $F(3, 2987) = 374.62$, $p< .001$, $R^2 = .27$. Resilience was found to moderate the relationship between anxiety and aggression, $F(1, 2987) = 44.16$, $p< .001$, $R^2 = .01$, so that greater long-term self-regulation was observed in participants with high resilience and low anxiety ($M = 94.94$, $SD = 11.76$), while lower scores were found in those with low resilience and high anxiety ($M = 78.82$, $SD = 13.11$). Similar low scores in long-term self-regulation were observed in participants with low resilience, regardless of their anxiety level (see Figure 2). Second, anxiety presented a negative effect and resilience had a

positive effect on short-term self-regulation, $F(3, 2987) = 334.94$, $p< .001$, $R^2 = .25$, with no significant interaction between these predictors, $F(1, 2987) = .25$, $p = .618$. Third, anxiety presented a positive total effect on aggression, $F(1, 2989) = 327.66$, $p< .001$, $R^2 = .10$, as well as a positive direct effect on aggression, after including mediators and moderator, $F(7, 2983) = 96.93$, $p< .001$, $R^2 = .18$. Significant indirect effects by anxiety on aggression were observed through long-term self-regulation, $\beta = -.07$, LLCI = -.09, ULCI = -.05, and through short-term self-regulation, $\beta = .15$, LLCI = .12, ULCI = .17. Resilience was found to moderate the relationships between long-term self-regulation, $F(1, 2983) = 27.93$, $p< .001$, $R^2 = .01$, and short-term self-regulation, $F(1, 2983) = 13.01$, $p< .001$, $R^2 = .01$, with aggression, respectively. Thus, more aggression was observed in participants with moderate long-term self-regulation and low resilience

Table 2: Hierarchical regression analysis of demographics, anxiety, self-regulation and resilience as predictors of aggressiveness

Steps	Variables	t	β	p
Step1 $F(2, 2988) = 2.90,$ $p = .055, R^2 = .01$	Age	-1.94	-.04	.052
	Gender	-1.43	-.03	.152
Step 2 $F(3, 2987) = 110.66,$ $p < .001, R^2 = .10$	Age	-1.33	-.02	.183
	Gender	-1.53	-.03	.127
	Anxiety	18.04	.31	.000
	Age	-1.66	-.03	.097
	Gender	-2.41	-.04	.016
	Anxiety	11.22	.23	.000
	Long-term SR	10.00	.20	.000
Step 3 $F(6, 2984) = 107.52,$ $p < .001, R^2 = .18$	Short-term SR	-15.24	-.30	.000
	Resilience	-2.62	-.05	.009

($M = 63.67$, $SD = 17.26$), and less aggression in those with high resilience and low long-term self-regulation ($M = 50.44$, $SD = 15.35$). Furthermore, more aggression was found in participants with low resilience and low short-term self-regulation ($M = 67.17$, $SD = 16.64$), while less aggression reported by those with high resilience and high short-term self-regulation ($M = 51.57$, $SD = 13.41$).

Figure 2 describes the results of these moderations. Models B and C showed the joint moderation of resilience and a sociodemographic variable, i.e., gender and age, in the multiple partial mediation of long-term and short-term self-regulation in the relationship between anxiety and aggression. Regarding Model B, results pointed out that the effect by anxiety on short-term self-regulation was jointly moderated by resilience and gender, so that moderate resilience in men was associated with similar levels of short-term self-regulation regardless anxiety, while low anxiety was associated with higher short-term self-regulation in participants with low or high resilience, $F(1, 2983) = 5.13$, $p = .024$, $R^2 = .01$. Thus, this interaction presented a significant effect on short-term self-regulation in men, $\beta = .06$, $F(1, 2983) = 5.19$, $p = .023$, while no significant results were observed in women, $\beta = -.01$, $F(1, 2983) = .36$, $p = .547$. Moreover, the relationship between short-term self-regulation and aggression was moderated by gender so that less aggression was detected with increasing levels of short-term self-regulation, but men presented higher scores than women in any level of short-term self-regulation. Finally, the relationship between long-term self-regulation and aggression was found to be jointly moderated by resilience and gender, $F(1, 2975) = 4.97$, $p = .026$, $R^2 =$

.01, so that the interaction between long-term self-regulation and resilience had a greater effect on aggression in men, $\beta = .16$, $F(1, 2975) = 22.88$, $p < .001$, than in women, $\beta = .07$, $F(1, 2975) = 13.29$, $p < .001$. Men with high resilience and high long-term self-regulation showed greater aggression ($M = 61.39$, $SD = 18.25$) than women with those levels of resilience and long-term self-regulation ($M = 53.81$, $SD = 13.88$). Figure 3 presents the results of these moderations.

Concerning Model C, age was tested as a moderator jointly with resilience. The results pointed out that the effects by anxiety on long-term self-regulation and on aggression were moderated by resilience and age. First, anxiety x resilience x age showed a significant effect on long-term self-regulation, $F(1, 2983) = 16.63$, $p < .001$, $R^2 = .01$. The effect of the interaction anxiety x resilience was stronger in participants aged 18-20, $\beta = -.14$, $F(1, 2983) = 56.51$, $p < .001$, than in the 21-23 age cohort, $\beta = -.09$, $F(1, 2983) = 45.57$, $p < .001$; while no significant effect was observed in the older age cohort, 24-35 years old, $\beta = -.02$, $F(1, 2983) = 1.12$, $p = .290$. In the 18-20 age cohort, increased long-term self-regulation was observed in those with high resilience and low anxiety, while no differences in long-term self-regulation were found with low or medium resilience regardless anxiety levels. Second, anxiety x resilience x age also had a significant effect on aggression, $F(1, 2975) = 14.53$, $p < .001$, $R^2 = .01$. Greater effect of the interaction anxiety x resilience was detected in the 24-35 years old group, $\beta = -.12$, $F(1, 2975) = 12.86$, $p < .001$, but no effect was observed in the 21-23 age cohort, $\beta = -.03$, $F(1, 2975) = 2.83$, $p = .093$. In the older age cohort, high resilience

Table 3: Standardized coefficients of the moderated-mediation analyses of the relationship between anxiety and aggression, through short-term and long-term self-regulation, and moderated by resilience (Model A), by resilience and gender (Model B) and by resilience and age (Model C)

	Model A Moderator: Resilience	Model B Moderators: Resilience & Gender	Model C Moderators: Resilience & Age
a1: ANX->SHO	-.44***	-.33***	-.37***
a2: ANX->LON	-.29***	-.37***	-.20***
b1: SHO-> AGG	-.30***	-.46***	-.34***
b2: LON->AGG	.18***	.55***	.14**
c': ANX->AGG (DIRECT EFFECT)	.23***	.19*	.21***
c: ANX->AGG (TOTAL EFFECT)	.31***	.31***	.31***
d1: ANX x RES -> SHO	.01	.12*	-.06
d2: ANX x RES -> LON	-.08***	-.10	-.21***
d3: ANX x RES -> AGG	-.02	-.09	.15**
d4: SHO x RES -> AGG	.09***	-.19**	.01
d5: LON x RES -> AGG	-.06***	.25***	.11*
RES-> SHO	.12***	.08	.04
RES-> LON	.34***	.28***	.35***
RES-> AGG	-.04*	-.03	-.15**
DEM-> SHO		.03	.01
DEM-> LON		.28***	.04
DEM-> AGG		-.08*	-.05*
e1: SHO x DEM -> AGG		.09*	.02
e2: LON x DEM -> AGG		-.20***	.02
e3: ANX x DEM -> AGG		.03	.01
e4: ANX x DEM ->SHO		-.06	-.04
e5: ANX x DEM ->LON		.04	-.04*
de1: ANX x RES x DEM -> LON		.01	.06***
de2: ANX x RES x DEM -> SHO		-.07*	.03
de3: ANX x RES x DEM -> AGG		.04	-.09***
de4: SHO x RES x DEM -> AGG		.07	-.04
de5: LON x RES x DEM -> AGG		-.09*	-.01
RES x DEM -> SHO		.02	.04*
RES x DEM -> LON		.02	-.01
RES x DEM -> AGG		-.01	.05*

Note: ANX: Anxiety; LON: Long-term self-regulation; SHO: Short-term self-regulation; RES: Resilience; DEM: Demographics (Gender or Age); AGG: Aggression. *** $p < .001$; ** $p < .01$; * $p < .05$
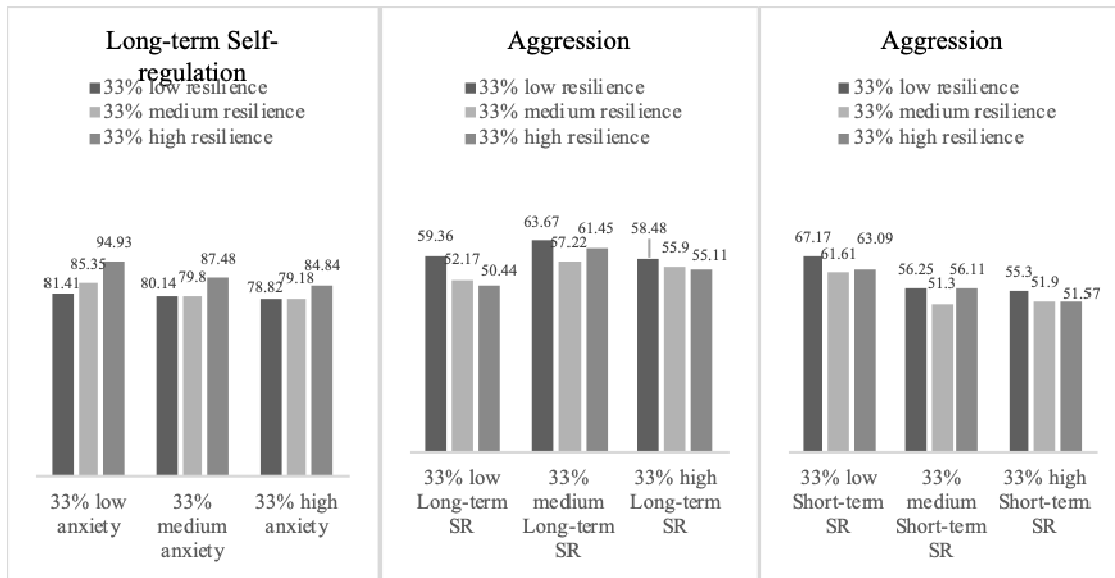
Figure 2: Results of moderations in Model A.

was not related with significantly different levels of aggressiveness regarding levels of anxiety, while more aggressiveness was detected in participants with low resilience and high anxiety. In other age cohorts, high resilience was related to more aggression in cases with high anxiety. Figure 4 shows the results of these moderations in Model C.

Discussion

The present national study about the promotion of mental health in Portuguese university students had three aims, to know the relationship between anxiety, aggression, both long-term and short-term self-regulation, and resilience; to examine the relationship between anxiety and aggression partially mediated by short-term and long-term self-regulation, with the moderation of resilience; and to analyze the moderation of resilience and a sociodemographic variable, i.e., gender and age, in the multiple partial mediation of long-term and short-term self-regulation in the relationship between anxiety and aggression in Portuguese youth.

Results indicated that anxiety was positively associated with aggression. Anxiety and aggression were negatively related to (both long-term and short-term) self-regulation and resilience. Aggression was more strongly related to short-term self-regulation than to the long-term type. Finally, self-regulation was positively associated with resilience, with greater effect in the case of long-term type. In relation to differences by gender and age, no statistic differences were found for the majority of variables. These results corroborate other similar investigations (Gomez-Baya, et al, 2017; Matos, et al., 2018), confirming that short-term self-regulation has a negative relationship with anxiety and aggression, so the higher the levels of self-regulation in the short term,the lower the levels of anxiety and aggression in students, and results also indicate that students can increase long-term self-regulation through resilience, since these two variables have a strong positive relation. Regarding gender and age differences, the results show that most of the relationships among the variables were not significant, suggesting that risk and protection factors should be worked on throughout life and regardless of whether individuals are male or female.

For the second and third goal, we analyzed the relationship between anxiety and aggression partially mediated by short-term and long-term self-regulation, with the moderation of resilience. Resilience was found to moderate the relationship between long-term self-regulation, and short-term self-regulation, with aggression, respectively. Thus, more aggression was observed in participants with moderate long-term self-regulation and low resilience, and less aggression in those with high resilience and low long-term self-regulation. Furthermore, more aggression was found in participants with low resilience and low short-term self-regulation, while less aggression was reported by those with high resilience and high short-term self-regulation. Regarding gender differences, this interaction presented a significant effect on short-term self-regulation in men, while no significant results were observed in women. Concerning age differences, the effect of the interaction anxiety x resilience was stronger in participants aged 18-20 than in the 21-23 age cohort, while no significant
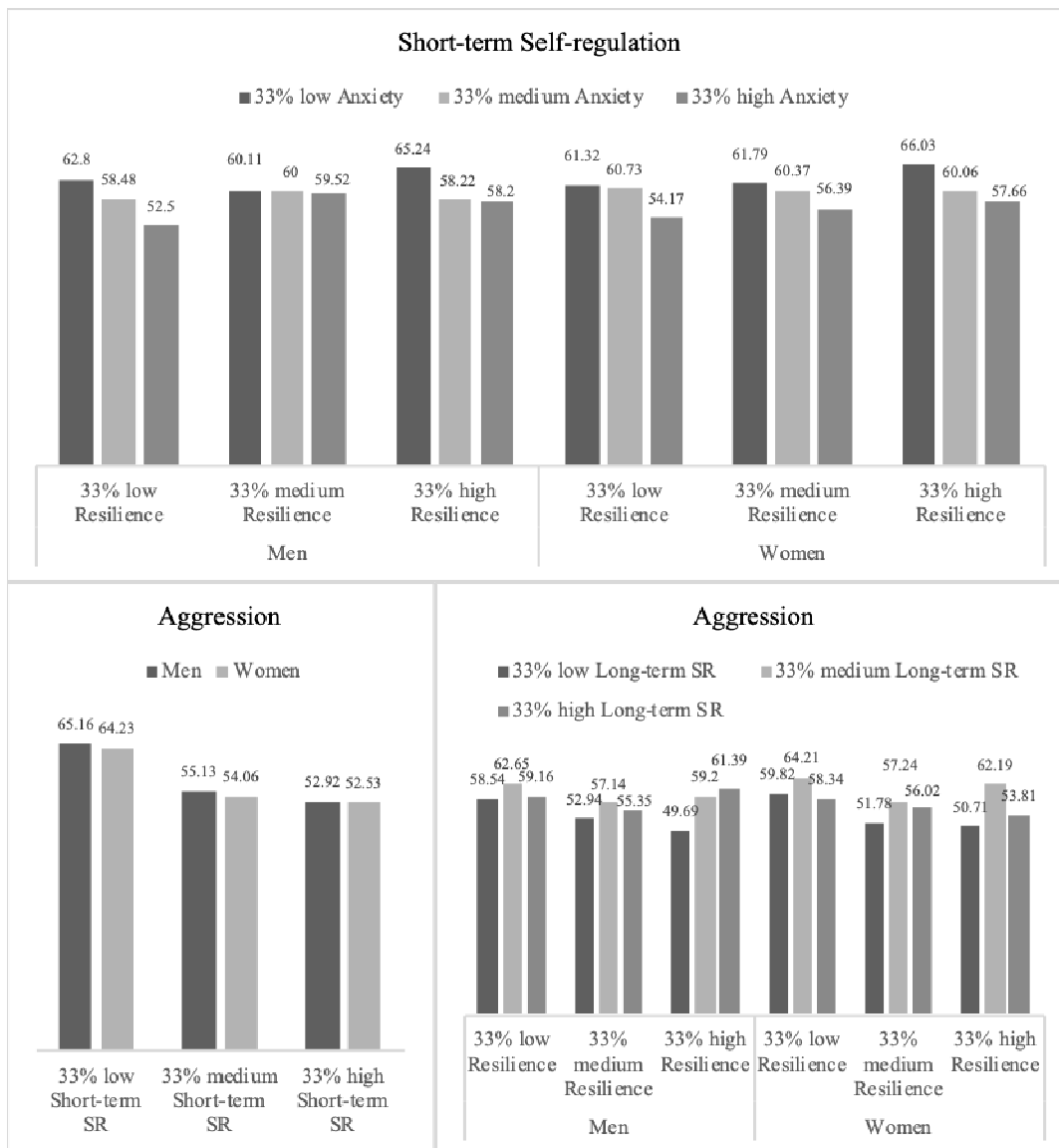
Figure 3: Results of moderations in Model B.

effect was observed in the older age cohort, 24-35 years old. Our results are similar to those found in other studies (Gomez-Baya, et al., *submitted*; Matos, et al., 2018).

This national survey addressed the need to define the responsibilities that universities/colleges have regarding student mental health, as "duty to care" encompasses this domain. The first step in exercising duty to care lies in the provision of campus mental health promotion/outreach programs. Enhancing promotion/outreach programs targeting specific psychological symptoms, namely aim to prevent anxiety and aggression and promote self-regulation and resilience were identified as a need across Portuguese universities.

Mental health is closely tied to overall well-being, and services that reduce stress and encourage self-care reflect this. Most institutions offer some form of social support to vulnerable groups, as well as programs that facilitate campus community involvement, and contribute to a healthy campus climate (Reis, Ramiro, Gomez-Baya, & Matos, 2018). However, it does not appear that their services are succeeding in promoting mental health and quality of life for students. Student-to-student or peer health educator programs have been shown to extend the reach of health (including mental health/well-being) services. Such programs involve training students on how
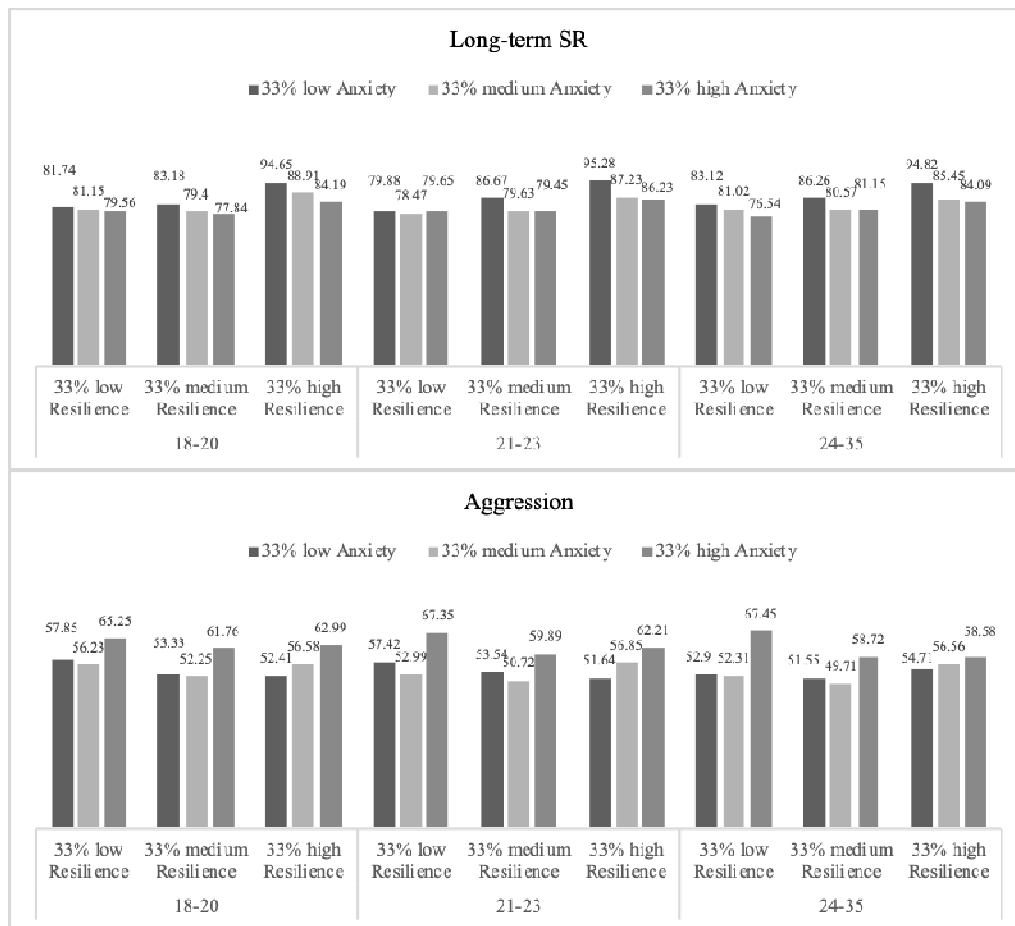
Figure 4: Results of moderations in Model C.

to identify those in distress and what services exist for such individuals (Kirsch et al., 2014). Implemented peer support initiatives, such as the Student Support Network (SSN) at the Worcester Polytechnic Institute in the United States, have shown promising results. The SSN is an initiative that educates student leaders on mental health campus resources and on reducing stigma associated with seeking help. Since its inception, a substantial increase in at risk students (as well as other student) have searched for counselling in the centre . While this may strain services initially, it may mitigate more serious mental health issues in the long term (and, likely, more costly strains on counselling services) (Kirsch et al., 2014). As such, it is worth considering whether adopting peer health educator programs should be encouraged more broadly across Portugal.

To date, systematic evaluations of mental health university initiatives are absent or unreported. Until Portuguese universities identify performance indicators, measure the impact of initiatives/services, and publicly disseminate this information, our understanding of

whether an institution is doing well in supporting mental health is limited. This research provides only a national trend of what is happening with the mental health of college students and the data may provide a reference for universities that are reviewing their own health services and working on projects related to health promotion.

College campuses offer opportunities to develop and evaluate mental health interventions that could be disseminated to the general population. Enhancing the mental health and students' prosocial behavior is consistent with the mission of higher education—to develop better citizens and leaders for society. As we have shown, there is a small, generally positive body of research regarding college student peer-to-peer interventions for mental illness. We encourage future development and evaluation of these promising interventions. We strongly encourage the development of practice-based research networks to evaluate the effectiveness of interventions designed to improve the mental health of college students.

Key Findings

- College students' need for mental health care has increased dramatically and mental health is closely tied to overall well-being,
- Self-regulation and resilience help reduce the effects of negative life events with its features of controlling stress and helping an individual cope with stressful situations rather than avoid them,
- Anxiety and aggression are essential traits to optimally cope with environmental challenges and trigger adaptive responses,
- College campuses offer opportunities to develop and evaluate mental health interventions that could be disseminated to the general population. Enhancing mental health and students' prosocial behavior is consistent with the mission of higher education—to develop better citizens and leaders for society.

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