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Effects of the COVID-19 pandemic on daily life, mental health and coping strategies in a subpopulation of Brazilian adolescents

Impactos da pandemia da COVID-19 sobre hábitos de vida, saúde mental e estratégias de enfrentamento em uma subpopulação de adolescentes brasileiros

Impactos de la pandemia de COVID-19 en los hábitos de vida, la salud mental y las estratégias de afrontamiento em uma subpoblación de adolescentes brasileños

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Abstract
The COVID-19 pandemic unprecedently impacted several aspects of people's lives, including their mental health. Since adolescence confers vulnerability to mental health problems, this study aimed to analyze the impact of COVID-19 pandemic on daily life, mental health and coping strategies adopted by adolescents in Brazil and the correlation between these measurements. The study evaluated 215 adolescents from a Brazilian Middle and High school. A questionnaire to verify the impact of the pandemic on daily life aspects (academic activities, family/social interaction, and physical/mental health), the Depression, Anxiety and Stress Scale – Short Form (DASS-21), and the Coping Response Inventory – Youth Form (CRI-Y) were used. Results showed that the pandemic affected family/social interaction and physical/mental health aspects of life, in particularly among teenage girls. For this population, depression, anxiety and stress levels were also higher. A significant interaction between gender and educational stage was observed for the CRI-Y strategy "Acceptance or Resignation", with girls, and in particularly older girls, punctuating more than boys. There was also a significant correlation between symptoms of depression, anxiety and stress and the following coping strategies: "Logical Analysis", "Cognitive Avoidance", "Acceptance-Resignation", and "Emotional Discharge". Results suggest that the pandemic significantly impacted different aspects of daily life and contributed to the increases in levels of depression, anxiety and stress in female adolescents and to the preferential use of maladaptive coping. These results highlight the urgent need for the development of effective intervention strategies, directed to stress coping, to mitigate the negative effects of COVID-19 in adolescents.
Keywords: COVID-19; Adolescents; Mental health; Anxiety; Depression; Stress; Coping.

Resumo
A pandemia da COVID-19 acarretou um impacto sem precedentes na vida da população mundial, funcionando como um importante desencadeador de problemas mentais. Uma vez que a adolescência confere vulnerabilidade a estressores ambientais, esse estudo analisou o impacto da pandemia na vida cotidiana, saúde mental e estratégias de enfrentamento adotadas por adolescentes brasileiros e possíveis correlações entre essas medidas. Foram aplicados um questionário de verificação do impacto da pandemia em diferentes aspectos da vida cotidiana (atividades acadêmicas, interação familiar/social e saúde física/mental), a *Depression, Anxiety and Stress Scale* (DASS-21) e o *Coping Response Inventory – Youth Form* (CRI-Y) em 215 adolescentes de uma escola brasileira de Ensino

Fundamental/Médio. Os resultados mostraram que a pandemia afetou particularmente a interação familiar/social e aspectos relacionados à saúde física/mental, de adolescentes do sexo feminino. Para essa população, os níveis de depressão, ansiedade e estresse também foram maiores. Observou-se uma interação significativa entre gênero e estágio de escolaridade para a estratégia "Aceitação ou Resignação", com as meninas mais velhas, pontuando mais. Houve correlação significativa entre os sintomas de depressão, ansiedade e estresse e as estratégias de enfrentamento: "Análise Lógica", "Esquiva Cognitiva", "Aceitação-Resignação" e "Descarga Emocional". Os resultados sugerem que a pandemia impactou diferentes aspectos da vida cotidiana da população estudada e contribuiu para a piora da saúde mental em adolescentes do sexo feminino, influenciando a utilização de estratégias desadaptativas. Faz-se urgentemente necessário o desenvolvimento de intervenções eficazes, direcionadas a mudanças no enfrentamento ao estresse, para mitigar os efeitos negativos da COVID-19 em adolescentes.
Palavras-chave: COVID-19; Adolescentes; Saúde mental; Ansiedade; Depressão; Estresse; Enfrentamento.

Resumen

La pandemia de la COVID-19 afectó sin precedentes varios aspectos de la vida de las personas, incluida su salud mental. Dado que la adolescencia confiere vulnerabilidad a los problemas de salud mental, este estudio tuvo como objetivo analizar el impacto de la pandemia de COVID-19 en la vida cotidiana, la salud mental y las estrategias de afrontamiento adoptadas por adolescentes brasileños y verificar la correlación entre estas mediciones. El estudio evaluó 215 adolescentes de una escuela media y secundaria, mediante la aplicación de un cuestionario para verificar el impacto de la pandemia en la vida cotidiana (actividades académicas, interacción familiar/social y salud física/mental), la escala *Depression, Anxiety and Stress - Short Form* (DASS-21) y el *Coping Response Inventory – Youth Form* (CRI-Y). Los resultados mostraron que la pandemia afectó la interacción familiar/social y aspectos de la salud física/mental entre las adolescentes. Los niveles de depresión, ansiedad y estrés también fueron más altos. Se observó una interacción significativa entre género y etapa educativa para la estrategia "Aceptación o Resignación", con las niñas puntuando más que los niños. También hubo una correlación significativa entre los síntomas de depresión, ansiedad y estrés y las estrategias de afrontamiento: "Análisis lógico", "Evitación cognitiva", "Aceptación-resignación" y "Descarga emocional". Los resultados sugieren que la pandemia impactó significativamente diferentes aspectos de la vida cotidiana y contribuyó al aumento de los niveles de depresión, ansiedad y estrés en adolescentes, favoreciendo estrategias de afrontamiento inadaptadas. Estos resultados resaltan la necesidad de estrategias de intervención efectivas, direccionadas a lidiar con el estrés, para mitigar los efectos negativos de COVID-19 en la salud mental de los adolescentes.
Palabras clave: COVID-19; Adolescentes; Salud mental; Ansiedad; Depresión; Estrés; Afrontamiento.

1. Introduction

On March 11th 2020, the World Health Organization (WHO) declared the outbreak of a novel global pandemic. The COVID-19 (Coronavirus Disease 2019) determined unprecedent preventive and control measures, with lockdowns, social distancing, and the closing of schools. Studies conducted throughout the pandemic years show increased mental health problems, in particular stress-related symptoms, i.e. anxiety and depression, associated with the COVID-19 outbreak in different segments of the world population, i.e. health and public workers, women, students and adolescents (Walton et al., 2020; Thibaut & van Wijngaarden-Cremers, 2020; Lee, 2020; Breslau et al., 2021; Manchia et al., 2022).

Adolescence is an intense learning period of social interaction, in which various aspects of social cognition are in development (Blakemore & Mills, 2014). It is also a time of increased exposure to stressors which often include academic demands (de Anda et al., 2000), disagreements with parents, peer, and romantic relationships (Strange et al., 2014). These factors might influence neurological and psychological development, thus leading to emotional and behavioral disorders. According to the World Health Organization (WHO, 2021), it is estimated that 14% of children and adolescents between 10-19 years-old experience mental health issues. Furthermore, anxiety and depression are some of the leading causes of disability among adolescents aged 15 to 19 years (WHO, 2021). When confronted with stressful situations, individuals reach out to coping strategies. Coping can be defined as cognitive and behavioral efforts to manage specific internal and/or external demands in response to stress (Elgorani & Gupta, 2022). Therefore, coping strategies are related to situational factors and can be learned, used, changed, and discarded according to specific circumstances (Elgorani & Gupta, 2022).

Taking the above information into account, the aim of the present study was to assess the effects of the COVID-19 pandemic on daily life academic and social aspects and physical/mental health of Brazilian adolescents, as well as to

investigate possible coping strategies used to deal with this major threatening event. Specifically, we assessed: 1) the impact of the COVID-19 pandemic on academic aspects, physical/mental health, and family/social interaction; 2) depression, anxiety, and stress-related symptoms; 3) coping strategies; and 4) possible correlations between these measurements.

2. Methodology

Sample and procedure: This study is a quantitative study (Estela, 2018) that interviewed and surveyed 267 students. Participants and their parents/legal guardians were informed about the research and its objectives and were asked to give voluntary and informed consent before taking part in the study. Participants mean age was 14.92 ± 1.38 (mean ± SD). They were mostly females (52.6%), belonged to high school (56.74%), and were from the medium socio-economic status group (90.6%). Participation in this study was voluntary, and participants were not given any incentive for their participation. Throughout September – December 2021, volunteers were asked to complete a demographic questionnaire, including age, gender, education stage and family income. The volunteers were also asked to fill out a questionnaire that aimed at investigating the level of impact of the COVID-19 pandemic on different aspects of their lives: academic activities, physical and mental health and family/social interaction. Two other instruments were also included in the study: the Depression, Anxiety and Stress Scale – Short Form (DASS-21) (Lovibond & Lovibond, 2004) and the third part of the Coping Response Inventory – Youth Form (CRI-Y) (Moos, 1993). This last instrument was asked to be answered identifying the COVID-19 pandemic as the stressor. The instruments took approximately 30 minutes to be completed. Due to the restrictions imposed by the COVID-19 pandemic, all procedures were carried out through online videoconferences (Google Meet™) and online forms (Google Forms™). The methodology was approved by the Research Ethics Committee of the University (under the number 0924P/2021), which is in accordance with international laws and policies. Of the original 267 volunteers, 215 (Mean age = 14.92; SD = 1.38) adequately completed the informed consents and/or the two instruments, comprising the analytic sample. Of the 215 participants (52.6% female and 47.7% male), 93 were enrolled in middle school, while 122 were high school students.

Instruments

To measure the level of impact of the COVID-19 pandemic on daily life, a self-report questionnaire was applied to verify: 1) Academic Activities (students were asked to evaluate: a) the quantity of schoolwork, b) difficulties in adapting to the remote/hybrid routine, c) difficulties in concentrating while studying at home, d) level of worries about academic progress);
2) Physical/Mental health (students were asked to evaluate a) level of worries about their family members and their own physical and mental health, b) feelings of loneliness, c) feelings of boredom, and d) worries about the future); 3) Family/Social interaction (students were asked to evaluate: a) difficulties to contact friends, b) level of virtual interaction with friends and family, 3) disagreements with friends and family). The questionnaire was designed as a 4-point Likert-type scale (0 - no impact; 1 - mild; 2 - moderate; 3 - severe). The scores for each block of questions (academic activities, physical and mental health, and family/social interaction) were calculated by the sum of the scores for the respective items.

The *Depression, Anxiety and Stress Scale – Short Form (DASS-21)* is a self-report scale organized in three sub-categories designed to measure emotional states of depression, anxiety, and stress. Each subscale is composed of seven items (21 total) based on a 4-point Likert-type scale (0 to 3) in which participants indicate the extent to which they experienced each of the symptoms described during the previous week. The scores for each emotional state are calculated by the sum of the scores for the respective items. Severity labels are organized as normal (depression: 0-9; anxiety: 0-7; stress: 0-14), mild (depression: 10-13; anxiety: 8-9; stress: 15-18), moderate (depression: 14-20; anxiety: 10-14; stress: 19-25), severe (depression: 21-27; anxiety: 15-19; stress: 26-33), and extremely severe (depression: 28+; anxiety: 20+; stress: 34+). The

Brazilian version of the DASS-21 questionnaire used in this study presents favorable psychometric qualities, being an adequate instrument for identifying symptoms of depression, anxiety, and stress in Brazilian adolescents (Patias et al., 2016).

The *Coping Response Inventory – Youth Form – CRI-Y* measures coping strategies, organized in eight categories: **Cognitive Approach coping** - Logical Analysis, and Positive Reappraisal; **Behavioral Approach coping** - Seeking Guidance and Support, and Problem Solving - **Cognitive Avoidance coping** – Cognitive Avoidance, and Acceptance or Resignation; **Behavioral Avoidance coping** - Seeking Alternative Rewards, and Emotional Discharge. Forty-eight items related to the description of behaviors associated with each specific coping strategy (six items each) are appointed based on a 4-point Likert-type scale (0-3). The scores for each category were calculated by summing the scores of their respective items. CRY-Y was translated and validated to the Portuguese language by Zanini et al. (2010), and possesses high internal consistency, similar to those found in the original version.

Analytic strategy

Results were described by means and standard deviation. The normality of residuals of variance analysis was assessed through quantile-quantile plot (QQplot) and homogeneity analyzed by standardized residuals vs. adjusted values. Two-way analysis of variance (ANOVA) (factor 1: educational stage; factor 2: gender) was used to compare the level of impact of the COVID-19 pandemic on daily life, DASS-21 and CRI-Y results. In case of significant interaction between factors, results were analyzed by the Tukey post-hoc test. To investigate correlations between DASS-21 measurements and the level of impact of the COVID-19 pandemic on "Academic Activities", "Physical/Mental Health" and "Family/Social Interaction"; and DASS-21 and CRI-Y variables, the Pearson correlation coefficient was used. For all analysis, a 5% level of significance was considered. The software used in this study was R Core Team (2021).

3. Results

Descriptive measures for COVID-19 impact on "Academic Activities", "Physical/Mental Health" and "Family/Social Interaction", according to gender and educational stage, are shown in Table 1. DASS-21 and coping strategies measurements are shown in Table 2 and 3, respectively.

Table 1 - Descriptive measures for COVID-19 impact on academic activities, physical and mental health and social and family interaction, according to gender and educational stage.

Sex	Segment		Academic activities	Physical and mental health	Social and Family interaction
Males	Middle school	Mean	10.16	11.65	6.82
	n=49	SD	3.48	6.20	2.93
	High school	Mean	10.34	13.04	7.23
	n=53	SD	3.05	5.51	2.78
	Total	Mean	10.25	12.37	7.03
	n=102	SD	3.25	5.86	2.85
Females	Middle school	Mean	10.05	15.66	8.18
	n=44	SD	2.99	4.63	2.58
	High school	Mean	11.54	17.99	7.87
	n=69	SD	2.67	3.89	2.61
	Total	Média	10.96	17.08	7.99
	n=113	SD	2.88	4.32	2.59
Total	Ensino Fundamental	Mean	10.11	13.55	7.46
	n=93	SD	3.24	5.84	2.84
	Ensino médio	Mean	11.02	15.84	7.59
	n=122	SD	2.89	5.25	2.69
	Total	Mean	10.62	14.85	7.53
	n=215	SD	3.07	5.62	2.75

SD: Standard deviation. Source: Authors.

Table 2 - Descriptive measures of DASS-21 variables, according to gender and educational stage.

Gender	Educational Stage		Anxiety	Depression	Stress
Male	Middle School n=49	Mean	6.57	9.67	14.29
		SD	6.26	9.73	11.27
	High School n=53	Mean	5.17	8.94	10.94
		SD	5.64	9.09	8.54
	Total n=102	Mean	5.84	9.29	12.55
		SD	5.95	9.36	10.03
Female	Middle School n=44	Mean	15.55	15.45	20.45
		SD	12.12	12.47	11.00
	High School n=69	Mean	13.10	19.65	22.26
		SD	9.97	11.99	11.47
	Total n=113	Mean	14.05	18.02	21.56
		SD	10.87	12.29	11.27
Total	Middle School n=93	Mean	10.82	12.41	17.20
		SD	10.46	11.42	11.50
	High School n=122	Mean	9.66	15.00	17.34
		SD	9.22	12.03	11.71
	Total n=215	Mean	10.16	13.88	17.28
		SD	9.77	11.81	11.59

SD: standard deviation. Source: Authors.

Table 3 - Descriptive measures for CRI-Y coping strategies, according to gender and educational stage.

Gender	Educational Stage		CRI - Y – Logical Analysis	CRI - Y – Positive Reappraisal	CRI - Y – Seeking Guidance and Support	CRI - Y – Problem Solving	CRI - Y – Cognitive Avoidance	CRI - Y – Cognitive Avoidance	CRI - Y – Seeking Alternative Rewards	CRI - Y – Emotional Discharge
Male	Middle School n=49	Mean	7.63	6.90	4.31	7.92	6.96	6.31	7.49	5.92
		SD	4.80	4.76	3.95	4.65	4.46	4.92	4.61	4.17
	High School n=53	Mean	8.19	7.75	4.57	7.89	7.43	6.19	8.34	5.23
		SD	4.22	4.51	3.57	4.34	4.92	3.90	3.75	3.15
	Total n=102	Mean	7.92	7.34	4.44	7.90	7.21	6.25	7.93	5.56
		SD	4.50	4.63	3.74	4.47	4.69	4.40	4.19	3.68
Female	Middle School n=44	Mean	9.59	9.02	5.61	9.50	9.86	7.23	9.11	9.07
		SD	3.92	4.52	4.37	4.11	4.33	4.36	3.98	3.92
	High School n=69	Mean	10.22	8.83	6.32	8.16	10.78	9.54	8.29	9.25
		SD	3.41	3.46	4.28	3.68	3.76	3.89	3.90	3.23
	Total n=113	Mean	9.97	8.90	6.04	8.68	10.42	8.64	8.61	9.18
		SD	3.61	3.89	4.31	3.89	4.00	4.21	3.93	3.50
Total	Middle School n=93	Mean	8.56	7.90	4.92	8.67	8.33	6.74	8.26	7.41
		SD	4.49	4.74	4.19	4.45	4.61	4.66	4.38	4.33
	High School n=122	Mean	9.34	8.36	5.56	8.04	9.33	8.08	8.31	7.50
		SD	3.90	3.96	4.06	3.97	4.60	4.22	3.82	3.76
	Total n=215	Mean	9.00	8.16	5.28	8.31	8.90	7.50	8.29	7.46
		SD	4.17	4.31	4.12	4.19	4.62	4.46	4.06	4.01

Source: Authors.

As shown in Table 4, two-way ANOVA showed a significant effect of gender for variables “Physical/Mental Health” and “Family/Social Interaction”, with girls showing a greater impact of COVID-19 on these measurements. Two-way ANOVA also showed a significant effect ($p<0.05$) of variable “Family/Social interaction” for educational stage, with younger girls punctuating more than older girls ($p<0.05$). No significant interactions between factors were shown. Two-way ANOVA also showed significant differences ($p<0.05$) between males and females for all measurements of DASS-21, with females showing significant increases in depression, anxiety and stress levels. Also, there were significant differences ($p<0.05$) between genders with respect to all coping strategies, with the exception of “Problem Solving” and “Seeking Alternative Rewards”.

Table 4 - Two-way analysis of variance (ANOVA) values for COVID-19 impact on daily life, DASS-21 and CRI-Y measurements.

Variables	Gender	Educational Stage	Interaction (Gender. Educational Stage)
Academic activities	0.091	**0.043**	0.118
Physical and mental health	**<0.001**	**0.008**	0.500
Family and social interaction	**0.010**	0.917	0.338
DASS-21 – Anxiety	**<0.001**	0.116	0.671
DASS-21 – Depression	**<0.001**	0.236	0.105
DASS-21 – Stress	**<0.001**	0.636	0.083
CRI - Y – Logical Analysis	**<0.001**	0.293	0.950
CRI - Y – Positive Reappraisal	**0.008**	0.592	0.372
CRI - Y – Seeking Guidance and Support	**0.004**	0.385	0.692
CRI - Y – Problem Solving	0.173	0.223	0.258
CRI - Y – Cognitive Avoidance	**<0.001**	0.243	0.712
CRI - Y – Acceptance or Resignation	<0.001	0.056	**0.039**
CRI - Y – Seeking Alternative Rewards	0.221	0.986	0.137
CRI - Y – Emotional Discharge	**<0.001**	0.622	0.382

Source: Authors.

A significant interaction between factors (gender vs. educational stage) was only observed for the CRI-Y strategy “Acceptance or Resignation” ($p=0.039$) (Table 5). The Tukey post-hoc test showed that for this coping strategy, female participants obtained higher scores than males ($p < 0.001$). Also, females in high school scored higher than those in middle school ($p=0.027$).

Table 5 - Multiple comparison between gender and educational stage for variable CRI-Y - Acceptance or Resignation.

Comparisons		Difference	Confidence Interval (95%)	p-*value*
Middle School	Female - Male	0.92	(-1.36; 3.20)	0.723
High School	Female – Male	3.35	(1.34; 5.35)	**<0.001**
Male	High School – Middle School	-0.12	(-2.30; 2.06)	0.999
Female	High School – Middle School	2.31	(0.19; 4.43)	**0.027**

Source: Authors.

Table 6 shows that there was a positive correlation between all measurements of COVID-19 impact on "Academic Activities", "Physical/Mental Health" and "Family/Social Interaction", and DASS-21 anxiety, depression and stress measurements ($p<0.05$), with coefficients varying between 0.24 to 0.51 for male students, and between 0.40 to 0.58 for female volunteers.

Table 6 - Correlation study between anxiety, depression and stress variables and COVID-19 impact on different aspects of daily life and academic life.

Academic Aspects									
DASS-21 Variables	**Total Sample**			**Males**			**Females**		
	Coefficient	IC 95%	*p-value*	Coefficient	IC 95%	*p-value*	Coefficient	IC 95%	*p-value*
Anxiety	0.34	(0.22;0.45)	<0.001	0.24	(0.04;0.41)	0.017	0.40	(0.24;0.55)	<0.001
Depression	0.48	(0.37;0.57)	<0.001	0.43	(0.26;0.58)	<0.001	0.52	(0.37;0.64)	<0.001
Stress	0.41	(0.29;0.52)	<0.001	0.29	(0.10;0.45)	0.004	0.51	(0.36;0.64)	<0.001
Physical and Mental Health									
Anxiety	0.50	(0.39;0.59)	<0.001	0.37	(0.19;0.52)	<0.001	0.48	(0.32;0.61)	<0.001
Depression	0.56	(0.46;0.65)	<0.001	0.48	(0.31;0.61)	<0.001	0.52	(0.37;0.64)	<0.001
Stress	0.59	(0.50;0.67)	<0.001	0.48	(0.31;0.61)	<0.001	0.58	(0.44;0.69)	<0.001
Family and Social Life									
Anxiety	0.43	(0.31;0.53)	<0.001	0.43	(0.26;0.58)	<0.001	0.42	(0.25;0.56)	<0.001
Depression	0.47	(0.36;0.57)	<0.001	0.51	(0.35;0.64)	<0.001	0.40	(0.23;0.54)	<0.001
Stress	0.51	(0.41;0.61)	<0.001	0.46	(0.29;0.60)	<0.001	0.53	(0.38;0.65)	<0.001

Source: Authors.

Table 7 (upper panel) shows that for both genders, "Logical Analysis", "Cognitive Avoidance", "Acceptance or Resignation" and "Emotional Discharge" variables were positively correlated with DASS-21 depression measurements ($p<0.05$), with coefficients varying between 0.36 a 0.46 for male students, and between 0.25 a 0.51 for female volunteers.
Table 7 (middle panel) also shows that for both genders, "Logical Analysis", "Cognitive Avoidance", "Acceptance or Resignation" and "Emotional Discharge" CRI-Y variables were positively correlated with DASS-21 anxiety measurements ($p<0.05$), with coefficients varying between 0.25 and 0.37 for male participants, and between 0.26 and 0.45 for female students. Table 7 (last panel) indicates that for male participants all coping variables positively correlate with stress levels ($p<0.05$), with coefficients varying between 0.20 and 0.50. For female participants, "Logical Analysis", "Cognitive Avoidance", "Acceptance or Resignation" and "Emotional Discharge" presented positive correlation with DASS-21 stress measurements ($p<0.05$), with coefficients varying between 0.33 and 0.56.

Table 7 - Correlation study between DASS-21 depression, anxiety and stress measurements and CRI-Y coping strategies.

Depression and CRI-Y

Variables	Total Sample			Males			Females		
	Coefficient	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***
CRI - Y – Logical Analysis	0.36	(0.23; 0.47)	<0.001	0.37	(0.19; 0.53)	**<0.001**	0.25	(0.07; 0.41)	**0.008**
CRI - Y – Positive Reappraisal	0.13	(0.00; 0.26)	0.056	0.18	(-0.02; 0.36)	0.073	-0.02	(-0.20; 0.17)	0.872
CRI - Y – Seeking Guidance and Support	0.15	(0.02; 0.28)	0.024	0.10	(-0.1; 0.29)	0.320	0.09	(-0.10; 0.27)	0.369
CRI - Y – Problem Solving	0.01	(-0.12; 0.15)	0.851	0.12	(-0.08; 0.31)	0.228	-0.14	(-0.31; 0.05)	0.146
CRI - Y – Cognitive Avoidance	0.51	(0.40; 0.60)	<0.001	0.36	(0.18; 0.52)	**<0.001**	0.51	(0.36; 0.64)	**<0.001**
CRI - Y – Acceptance or Resignation	0.48	(0.37; 0.58)	<0.001	0.45	(0.28; 0.59)	**<0.001**	0.42	(0.26; 0.56)	**<0.001**
CRI - Y – Seeking Alternative Rewards	0.08	(-0.05; 0.21)	0.227	0.17	(-0.02; 0.35)	0.087	-0.03	(-0.21; 0.16)	0.781
CRI - Y – Emotional Discharge	0.54	(0.44; 0.63)	<0.001	0.46	(0.29; 0.60)	**<0.001**	0.46	(0.30; 0.60)	**<0.001**

Anxiety and CRI-Y									
Variables	**General Sample**			**Male**			**Female**		
	Coefficient	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***
CRI - Y – Logical Analysis	0.31	(0.19; 0.43)	<0.001	0.25	(0.05; 0.42)	**0.013**	0.26	(0.08; 0.43)	**0.005**
CRI - Y – Positive Reappraisal	0.17	(0.04; 0.30)	0.011	0.18	(-0.01; 0.37)	0.064	0.08	(-0.11; 0.26)	0.425
CRI - Y – Seeking Guidance and Support	0.18	(0.05; 0.31)	0.007	0.18	(-0.01; 0.36)	0.066	0.09	(-0.10; 0.27)	0.365
CRI - Y – Problem Solving	0.10	(-0.03; 0.23)	0.146	0.17	(-0.03; 0.35)	0.088	0.02	(-0.17; 0.20)	0.873
CRI - Y – Cognitive Avoidance	0.43	(0.32; 0.54)	<0.001	0.29	(0.10; 0.46)	**0.003**	0.40	(0.23; 0.55)	**<0.001**
CRI - Y – Acceptance or Resignation	0.39	(0.27; 0.50)	<0.001	0.36	(0.18; 0.52)	**<0.001**	0.31	(0.14; 0.47)	**0.001**
CRI - Y – Seeking Alternative Rewards	0.06	(-0.08; 0.19)	0.411	0.18	(-0.02; 0.36)	0.071	-0.06	(-0.24; 0.13)	0.548
CRI - Y – Emotional Discharge	0.52	(0.41; 0.61)	<0.001	0.37	(0.19; 0.53)	**<0.001**	0.45	(0.29; 0.59)	**<0.001**

Stress and CRI-Y									
Variables	**General Sample**			**Male**			**Female**		
	Coefficient	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***	**Coefficient**	**CI 95%**	***p-value***
CRI - Y – Logical Analysis	0.40	(0.29; 0.51)	<0.001	0.37	(0.19; 0.53)	**<0.001**	0.33	(0.16; 0.49)	**<0.001**
CRI - Y – Positive Reappraisal	0.20	(0.06; 0.32)	0.004	0.21	(0.01; 0.39)	**0.037**	0.08	(-0.11; 0.26)	0.429
CRI - Y – Seeking Guidance and Support	0.24	(0.11; 0.36)	<0.001	0.20	0.00; 0.38)	**0.047**	0.17	(-0.02; 0.34)	0.079
CRI - Y – Problem Solving	0.13	(-0.01; 0.26)	0.061	0.22	(0.03; 0.40)	**0.026**	-0.01	(-0.19; 0.17)	0.915
CRI - Y – Cognitive Avoidance	0.46	(0.35; 0.56)	<0.001	0.33	(0.14; 0.49)	**0.001**	0.43	(0.27; 0.57)	**<0.001**
CRI - Y – Acceptance or Resignation	0.42	(0.31; 0.53)	<0.001	0.39	(0.21; 0.54)	**<0.001**	0.34	(0.16; 0.49)	**<0.001**
CRI - Y – Seeking Alternative Rewards	0.17	(0.04; 0.30)	0.011	0.20	(0.01; 0.38)	**<0.001**	0.11	(-0.08; 0.29)	0.244
CRI - Y – Emotional Discharge	0.61	(0.52; 0.69)	<0.001	0.50	(0.34; 0.64)	**<0.001**	0.56	(0.42; 0.68)	**<0.001**

CI: Confidence Interval. Source: Authors.

4. Discussion

Adolescence is a developmental period characterized by increased exposure to stressors (Spear, 2000; Romeo, 2013; Ho, 2019). The COVID-19 pandemic was a serious uncontrollable stressful event and several previous studies have pointed out its important physical and mental consequences (Lee, 2020; Singh et al., 2020; Zhang et al., 2020; Zhou et al., 2020; Jones et al., 2021; Walton et al., 2020; Thibaut & van Wijngaarden-Cremers, 2020; Lee, 2020; Breslau et al., 2021; Manchia et al., 2022). The purpose of the present study was to measure the impact of the COVID-19 pandemic on academic activities, physical/mental health and family/social interaction, levels of depression, anxiety and stress-related symptoms, the use of coping strategies in adolescent students of a Brazilian middle and high school, and the degree of correlation between these measurements.

With respect to the impact of COVID-19 on academic activities, results suggest that the closing of schools and the remote/hybrid programs adopted impacted the learning process. This data agrees with previous results (Lee, 2020; Duan et al, 2020; Cohen et al., 2020; Ellis et al., 2020; Pigaiani et al., 2020; Lessard & Puhl, 2021; Scott et al., 2021). Specifically, students reported increases in the quantity of schoolwork, difficulties in adapting to the remote/hybrid routine, difficulties in concentration, and worries about their academic progress. Students, and in particularly girls, also reported worries regarding their physical and mental health. Mental health issues have been frequently associated to changes in everyday life imposed by the pandemic (Guessoum et al, 2020; Saurabh & Ranjan, 2020; Spinelli et al., 2020, de Figueiredo et al., 2021; Jones et al., 2021, Manchia et al., 2022). In particularly, increases in feelings of loneliness, boredom and concerns about the future were reported. These results confirm previous data showing that the COVID-19 pandemic determined a significant impact in the psychological health of children and adolescents (Chen et. al, 2020; Deolmi & Pisani, 2020; Duan et al., 2020; Fegert et al., 2020; Saurabh & Ranjan, 2020; Singh et al., 2020; Zhang et al., 2020; de Figueiredo et al., 2021; Jones et al., 2021, Manchia et al., 2022).

The participants of the study also described a reduction in their interaction with friends, great increases in levels of virtual interaction, with the majority of the population interviewed describing no increases in disagreements with friends and family. These results confirm previously reported data, showing that adolescents maintained intense virtual contact with peers as a form of social support (Pigaiani et al., 2020; Guessoum et al., 2020; Keles et al., 2020). It is important to point out that nowadays virtual spaces are an important source of social gathering (Pigaiani et al., 2020). Nevertheless, the question that remains is if virtual contact is sufficient for an adequate social and neurodevelopment (de Figueiredo et al., 2021). In fact, one important observation of the present study was that COVID-19´s impacts on academic activities, physical/mental health and family/social interaction were positively correlated with depression, anxiety and stress measurements, and that adolescent girls were particularly affected.

The observed increases in depression, anxiety and stress in female adolescents are in accordance with the literature (Cyranowski et al., 2000, Kessler et al., 2005; Leach et al., 2008; Beesdo-Baum & Knappe, 2012). Previous studies show that differences between male and females are subtle during infancy but tend to increase during adolescence (Cyranowski et al., 2000; Beesdo-Baum & Knappe, 2012). In fact, among the risk factors for stress-related psychopathologies, one particularly stands out: gender. Being female doubles the risk for anxiety disorders (Craske et al., 2017) and depression (Albert et al., 2015). The reason for this discrepancy is not yet clear, though studies suggest that it can be related to several factors such as sexual hormones and psychosocial risk factors (McHenry et al., 2014). The cyclic variation of female hormones seems to affect brain structures related to mood and behavior modulation, as the recurrent falling in estrogen levels may interfere in the ability of this hormone to neutralize the effects of the glucocorticoids released during the stress response, determining a higher female vulnerability to anxiety and depression symptoms (Oldehinkel & Bouma, 2011). Furthermore, psychosocial risk factors might

also be involved in these gender differences. For instance, social demands, personality characteristics, economic and academic rewards have also been associated to the increases in anxiety/depression symptoms in females (Leach et al., 2008).

Coping strategies are behavioral mechanisms to deal with stressful events, which may be daily stressors or major life events. The later are considered singular and traumatic, generating great impact in the individual's life. Cognitive approach coping seems to be more associated with daily stressors, whereas avoidance coping appears to be more related to major life events (Compas et al, 2017). Furthermore, evidence suggests an association between the efficiency of coping strategies and perception of control over the stressor. When the stressor is considered controllable, positive adjustments are observed through the use of approach coping strategies. On the other hand, in situations that are considered uncontrollable, avoidance coping is frequently adopted (Algorani & Cupta, 2022).

The establishment of coping strategies varies according to multiple factors such as gender, age, and personality (Compas et al., 2001). Regarding gender, there is some consensus that males tend to use approach coping, while females tend to use avoidance coping (Pikó, 2001; Matud, 2004; Moret-Taytay et al., 2016). Also, in the transition between infancy to adolescence an increase in avoidance coping is observed (Compas et al., 2017), as well as the tendency for prioritizing cognitive strategies over behavioral ones (Moos, 1993). Finally, personality aspects, as well as sociodemographic, cultural, environmental, and cognitive development can also influence the use of coping strategies (Compas et al., 2001; Pikó, 2001). Coping strategies can also be classified as adaptive or maladaptive. Strategies that do not resolve the problem and increase anxiety in face of the stressful situation are maladaptive (Kelly et al., 2008; Compas et al., 2017). This is the case for avoidance strategies (Hampel & Petermann, 2005). As such, these strategies increase the risk factor for psychological problems in children and adolescents (Compas et al., 2001; Hampel & Petermann, 2005; Seiffge-Krenke, 2015). Frequently, the inability to deal with stressful situations can lead to impulsive and destructive behavior, such as substance abuse, violence, school evasion and suicide (Kessler et al., 2005).

For all participants, there were positive correlations between depression and anxiety indexes and the following CRI-Y coping strategies: "Logical Analysis" (a cognitive approach coping strategy), and three avoidance coping strategies ("Acceptance and Resignation", "Seeking Alternative Rewards" and "Emotional Discharge"), the first two involving cognitive efforts of avoidance and the last, behavioral efforts. Among females, the DASS-21 stress variable was also positively correlated with these same coping strategies. On the other hand, for males, there was a positive correlation with all coping strategies.

Furthermore, our results suggest the preferential use by girls of the coping strategy "Acceptance or Resignation". It refers to a cognitive effort to react to a problem, by accepting it. Evidence indicates that females tend to rely more than males on avoidance coping, especially when considering the stressful event to be uncontrollable (Frydenberg & Lewis, 1991; Pikó, 2001; Matud, 2004; Moret-Taytay et al., 2016). In such cases, the use of such strategies could be interpreted as a perception of lack of empowerment (Frydenberg & Lewis, 1993; Kelly et al., 2008). The difference observed between educational stages for female students could be justified by the tendency throughout adolescence to gradually increase avoidance coping, with the increased exposure to stress. Therefore, older students would rely more on such strategies than younger ones (Frydenberg & Lewis, 1993; Compas et al., 2017).

5. Conclusion

To conclude, the present results suggest that the COVID-19 pandemic led to difficulties regarding academic activities, physical/mental health and family/social interaction of a subpopulation of Brazilian adolescents, and in particularly among females, that were positively correlated with increases in depression, anxiety and stress-related symptoms. It was also shown

that to deal with the negative outcomes imposed by the COVID-19 pandemic in their daily lives, the use of avoidance coping strategies were adopted by these adolescents, notably by older females. These strategies are more predictive of anxiety and depression and tend to be associated to decreases in psychological well-being, as well as a to function as predictive factors for the development of mental health disorders. Considering these results, the present study highlights the urgent need for the development of effective intervention strategies that may mitigate the negative effects of COVID-19 in this population.
Our results suggest that such interventions could be directed to the modification of coping patterns, i.e., stimulating adaptive coping strategies that contribute to emotional well-being and to the prevention of future psychological burdens.

Limitations of this study must be acknowledged, such as the small size and the social economic status of the adolescent population analyzed, primarily from high income families. The effects of the pandemic on mental health of adolescents from other sociodemographic backgrounds would possibly be distinct from those observed in this study. Furthermore, the remote form of data collection, due to social isolation protocols, might also have influenced the obtained results.

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