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# Mental Health and their relationship with physical activity and emotional regulation strategies in Spanish adolescents

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## ABSTRACT

Numerous studies have focused on variables related to preventing and promoting mental health in adolescence. The purpose of the present study was to analyze to what extent emotion regulation strategies mediate the effect of physical activity on adolescent mental health. The sample comprised 173 adolescents, who completed the "Cognitive Emotion Regulation Questionnaire, CERQ", the "Mental Health Scale, MH-5" and the "Physician-based Assessment and Counseling for Exercise, PACE". The results showed adaptive emotion regulation strategies have a potentiating mediating effect between physical activity and mental health and this effect decreases with maladaptive emotion regulation strategies.

## La salud mental y su relación con la actividad física y las estrategias de regulación emocional en adolescentes españoles

## RESUMEN

Numerosos estudios se han centrado en variables relacionadas con la prevención y promoción de la salud mental en la adolescencia. El propósito del presente estudio fue analizar en qué medida las estrategias de regulación emocional pueden mediar el efecto de la actividad física en la salud mental de los adolescentes. La muestra estuvo compuesta por 173 adolescentes, quienes completaron el "Cuestionario de Regulación Emocional Cognitiva, CERQ", la "Escala de Salud Mental, MH-5" y el "Cuestionario de Actividad física, PACE". Los resultados mostraron que las estrategias de regulación emocional adaptativa tienen un efecto mediador potenciador entre la actividad física y la salud mental y este efecto disminuye con las estrategias de regulación emocional desadaptativas.

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## Introduction

Researchers consider adolescence to be one of the most vulnerable stages for mental health. The prevalence of mental health problems increases between 12 and 26 years, and its symptoms usually remain constant until adulthood. In fact, the approximately 50% of the mental disorders suffered by adults have their origin in adolescence (Patalay et al., 2016). In this same sense, according to the National Health Survey (NHS), mental health disorders are considered the most prevalent source of disability affecting young people today (ENSE, 2017), with an estimated 20% of adolescents experiencing mental health concerns (Silke, Sword & Heary, 2016).

Hence, the emotional problems of adolescents are the subject of increasing attention (Li, Chan, Chung & Chui, 2010; Carli et al., 2014; Ortuño-Sierra, Aritio-Solana & Fonseca-Pedrero, 2018). These problems, of which depression is the most common (Özyurt et al., 2021), are a significant concern for society.

The transition from childhood to adolescence involves new responsibilities, greater personal autonomy and new relationships, all of which, in turn, require a high capacity for self-management and self-regulation (Baader et al., 2014). Social environments have a great influence on adolescents' coping strategies. For example, the impact of parents' marital relationship on children's mental health has been evidenced (Li et al., 2020). Emotion regulation is higher among adolescents with supportive parents in positive relationships and lower among adolescents with harsh parents in family environments that are hostile, chaotic and coercive (Wang et al., 2019). In fact, recent studies have shown that parents' perception of their children's emotional capacities and vice versa has an impact on the image of the children's own emotional capacities and directly and indirectly on their mental health (Sánchez-Núñez et al., 2020).

Regarding gender differences in mental health, it has been found that women suffer from higher levels of depression and anxiety, as well as from lower levels of assertiveness (Bailey, Howells & Glibo, 2018; Gitay et al., 2018; Özyurt et al., 2021), while men show greater prevalence of alcohol consumption and drug use (Evans, Grella & Upchurch, 2017; Magidson et al., 2017), as well as higher rate of suicide (Aguilar-Velázquez et al., 2017; Sher et al., 2018).

Cultural factors play a key role in how parents teach or model the different emotional skills to their children and in how they express or regulate their emotions (Markus & Kitayama, 2010; Sung, 2010; Halberstadt & Lozada, 2011). The role of differential education in emotional regulation strategies and their impact on adolescent mental health is a topic of in-depth study.

## Relationship between Mental Health and Strategies for Emotion Regulation

Emotion Regulation (ER) refers to "processes that influence which emotions we have, when we have them, and how we experience or express these emotions" (Gross, 1998, p.275). ER is related to emotions that may arise in any context (Gross et al., 2006) and emotion dysregulation is a clear sign of numerous psychopathologies in adolescents (Bender et al., 2012; Chervonsky & Hunt, 2019; Yıldız & Duy, 2019; De France & Hollenstein, 2021).

Although several types of strategies for ER are known to exist, not all of these are effective (Koole, 2009). Garnefski, Kraaij & Spinhoven (2001) define nine strategies for ER, classified in two groups: adaptive (positive reappraisal, planning, positive refocusing, acceptance and putting into perspective) and maladaptive (rumination, self-blame, other-blame, and catastrophizing). The definition of these strategies as adaptive or maladaptive is grounded in their association with symptoms of psychopathology (Aldao, Nolen-Hoeksema &

Schweizer, 2010). Previous research has shown that mental health is associated with the adaptive flexibility of an individual's emotion regulation strategies rather than any one particular ER strategy (Conroy, Curtiss, & Barthel, 2020). Definitively, high ER skills are linked to a better quality in social relationships, subjective well-being, positive affect, satisfaction with life, optimism, happiness, personal initiative and mental health (Aldao, Nolen-Hoeksema & Schweizer, 2010; Berking, 2010; Lopes et al., 2011; Trompeter, de Kleine & Bohlmeijer, 2017; Özyurt et al., 2021), while people with low ER abilities, in response to negative situations that generate high emotional activation, have greater difficulty in controlling the emission of aggressive behavior towards others and are positively associated with stress, depression and anxiety (Garnefski et al., 2001; Megías, et al., 2018).

Although there is extensive research indicating the vital role of emotion regulation strategies (ERS) in mental health, such studies in adolescents have recently begun to proliferate, due to the elaboration of specific evaluation measures for this stage of development (Zhou et al., 2020). Appropriate use of ERS and physical and mental health play important and interrelated roles in adolescent well-being (Reinelt, 2020; McLachlan et al., 2021; Murayama et al., 2021). In fact, poorer mental and social well-being appears to be related to ERS use, particularly greater use of suppression. On the other hand, the greater use of reappraisal might provide some protection (Chervonsky & Hunt, 2019; De France & Hollenstein, 2021). Greater preference for suppression in adolescents has been associated with lower well-being, including psychological health, emotional loneliness, and negative affect (Verzeletti, 2016). Suppression fails to decrease emotion experience and also increases physiological responding for suppressors and their social partners (Gross 2002). In this sense, in a study with Spanish adolescents, a mediation analysis showed that difficulties in identifying feelings were indirectly related to greater use of dysfunctional ERS through their relationship with negative affect in at-risk gamblers (Estévez et al., 2021). Other studies have also revealed that maladaptive ERS, such as self-blame and other-blame, mediate the association between negative problem orientation and psychological distress in Turkish adolescents (Söğüt et al., 2021).

Additionally, recent studies have shown how cognitive reappraisal is a protective factor against alcohol abuse for immigrant adolescents (Laghi, 2021). In a sample of Italian adolescents, Verzeletti (2016) found that cognitive reappraisal was positively associated with better well-being outcomes for most indicators, especially life satisfaction, social support perception, and positive affect. One reason for this may be that reappraisal decreases emotion experience (Gross, 2002).

Definitively, assisting adolescents in developing functional ERS improve their mental health quality (Horn, Pössel & Hautzinger, 2011; Yıldız & Duy, 2019).

## Relationship between Physical Activity and Mental Health

Research on the effect of Physical Activity (PA) on the mental health of children and adolescents has received much less attention than that conducted with adults (Bailey, Howells & Glibo, 2018; Jiang et al., 2021). However, the practice of physical exercise undeniably benefits mental health, emotional well-being and quality of life, regardless of gender (Deslandes et al., 2009; Ahn & Fedewa, 2011; De la Cruz-Sánchez et al., 2011; Bernstein & McNally, 2018; Korge & Nunan, 2018; Ogawa et al., 2019). It has also been shown that a sedentary lifestyle has detrimental effects on psychological well-being related to an increase in depression and anxiety (Blough & Loprinzi, 2018). When talking today about adolescents' free time,

we must consider new technologies and the Internet as one of the most popular activities, and one that leads to sedentary lifestyles. Nevertheless, there is still no consistent evidence that physical activity (PA) levels have decreased over recent decades (Guinhoya, Samouda & De Beaufort, 2013; Wold et al., 2016). It is, however, a topic of growing interest due to its impact on physical and emotional well-being.

Associations between physical activity and mental health in adolescents have been evidenced in various studies (Biddle y Asare, 2011; Nagamatsu, 2016; Okechukwu, 2020; Peihua & Nan, 2020). The evidence presented by Bailey, Howells and Glibo (2018) suggests that PA at school can play a valuable role in protecting adolescents from poor mental health. Physical activity interventions have the potential to address this issue given they are low-cost, easy to implement, and there is growing evidence supporting their effectiveness (Heinze, 2020). In this regard, recently, Do Santos et al., (2020) found that adolescents who were more active in physical education classes and leisure were less likely to suffer social isolation, a factor closely related to mental health.

Delving into the factors associated with the influence of physical exercise on mental health, it is worth noting the national longitudinal study carried out with adolescent American students (Rees & Sabia, 2010), where the difficulties in measuring factors that might be correlated with both physical activity and mental health were underlined. The study revealed that although ordinary estimates showed that exercise is associated with improved psychological well-being, after controlling for individual heterogeneity, the relationship decreased and was often non-significant. For this reason, they recommended controlling for the influence of unmeasured school and individual level confounding factors.

### ***Relationship between Strategies for Emotion Regulation and Physical Activity***

Compared to the emotion regulation strategies cited in the previous section, which are considered cognitive or covert emotion regulation strategies, physical activity as an ERS is included in the group of overt behaviors. There is no direct association between these overt behaviors and emotion regulation (Aldao & Dixon-Gordon, 2014). For this reason, the role played by physical activity in mental health should not be overlooked (Biolcati, Cani, & Badio, 2013). This model proposes that covert ERS, such as rumination, have a strong negative impact, leading to an increased likelihood of an individual making use of a (dysfunctional) act of overt emotion regulation. In the study by Aldao et al. (2014) in university students, overt regulation strategies (e.g., alcohol use, arguing with peers, seeking advice, and avoiding certain environments) were found to predict symptoms of mental disorders to a greater degree than the more commonly studied covert strategies (e.g., worry/rumination). Such findings make us ponder whether using inappropriate covert regulation strategies might augment reliance on maladaptive overt strategies, thus increasing discomfort and significantly impairing mental health.

Studies in adolescent population in China have prescribed physical exercise, specifically Tai Chi, together with a brief therapy focused on solutions, which could be similar to some of the adaptive emotional regulation strategies. They reported greater effectiveness in reducing anxiety and depression compared to other experimental conditions with traditional mental health interventions (Lu, Wang & Dong, 2017).

Few studies have analyzed the relationship between engaging in PA and ERS (Riggs et al., 2012; Isasi, Ostrovsky & Wills, 2013;

Bernstein & McNally, 2018; Edwards et al., 2018). These studies show that adolescents with better ER ability present healthier life behaviors, and the practice of exercise helps regulate emotion. In this sense, exercise has been identified as a coping strategy for the management of stress, depression, and anxiety. A doctoral thesis, using hierarchical regression analyses in undergraduate participants with a history of abuse, found that specific domains of emotion regulation are the most significant in predicting physical and psychological well-being, beyond the impact of child abuse or exercise (Carroll, 2014).

In light of this review of the literature, we can assume that all the variables subject to study are significantly related to each other, although relatively little attention has been devoted to studying them in conjunction. Analyzing how both strategies can be related, in such a way that they could enhance each other, is essential for prevention and intervention in the mental health of adolescents. To the best of our knowledge, no previous studies have related all the variables in conjunction in adolescent population. Therefore, the aim of this study is to analyze the extent to which ERS mediate the effect of PA on adolescent mental health. To this end, we propose the following hypothesis:

H1: Adaptive emotional regulation strategies exert a positive mediating effect on the relationship between physical activity and mental health in adolescents. That is, the positive effect of physical activity on adolescent mental health increases when adaptive emotional regulation strategies are also used.

H2: The effect of physical activity on mental health is mitigated when maladaptive emotional regulation strategies mediate.

## **Method**

### ***Participants***

The sample consisted of 173 students aged between 14 and 17 years ( $M = 14.91$ ;  $SD = .81$ ), of whom 86 were girls (49.7%), with 81.5% being PA practitioners. The participants attended two secondary schools in Castilla-La Mancha and were enrolled in 3rd and 4th year of E.S.O (compulsory secondary education). Participants who did not complete all the instruments were discarded.

### ***Instruments***

**“Cognitive Emotion Regulation Questionnaire”** (CERQ; Garnefski, Kraaij & Spinhoven, 2002, adapted to Spanish by Domínguez-Sánchez, Lasa-Aristu, Amor & Holgado-Tello, 2013).

This instrument is composed of 36 items that examine 9 cognitive ERS people use after an unpleasant or stressful experience.

Each strategy is examined by 4 items. The strategies are: 1) Rumination (Thinking excessively about feelings and thoughts related to the unpleasant event); 2) Catastrophizing (excessive thoughts that emphasize the tragedy experienced); 3) Self-blame (thoughts that attribute the cause of the negative event and the consequent unpleasant emotion to oneself); 4) Other-blame (thoughts that attribute the cause of the negative event and the consequent unpleasant emotion to third parties); 5) Putting in perspective (downplaying and comparing the severity of the event with others already experienced); 6) Acceptance (thoughts that accept that the negative event occurred); 7) Positive refocusing (pleasant and cheerful thoughts, instead of focusing on the stressful event); 8) Positive reappraisal (thoughts that give a positive meaning to the unpleasant event); 9) Refocusing on planning (thinking about

the steps that must be taken to solve a problem). The first four strategies are maladaptive and the second five are adaptive.

Responses are rated on a 5-point Likert scale where 1= “almost never” and 5= “almost always”). The indices of internal consistency of the factors, in the original scale, ranged between .75 and .86, while within the Spanish sample, the internal consistency measure oscillates between .60 and .89. In our sample, the internal consistency (Cronbach's alpha) of the subscales ranged from .45 to .88.

#### “Mental Health Scale-5” (MH-5; Alonso, Prieto & Antó, 1995).

This is one of the subscales of the SF-36 Health Status Questionnaire from Ware & Sherbourne (1992), adapted to Spanish by Alonso, Prieto & Antó (1995). It comprises 5 items on the area of emotional well-being and evaluates respondents' mental health, particularly, the degree of depressive and anxious symptomatology they have presented during the last month. The higher the score on this scale, the better is the mental health. The responses are coded by means of a Likert-type scale with six response options, where 1 = “always” and 6 = “never”. The internal consistency of this scale has been shown to be adequate, with a Cronbach's alpha between .77 y .85 (Vilagut et al., 2005). The internal consistency of the questionnaire in our sample was .87.

#### “Physician-based Assessment and Counseling for Exercise” (PACE; Patrick, 2001, adapted to Spanish language by Martínez-Gómez et al., 2009)

By means of two questions, this questionnaire measures how many days the respondent did at least 60 minutes of PA in the last week (PACE 1), and how many days they do PA in a typical week (PACE 2). In this study, only PACE 2 was used.

#### Procedure

Once the objectives of the research were explained and having obtained the permission of the directors of both institutes and agreement of teachers, the students were asked to complete the instruments. All the participants filled out the informed consent form before completing the scales. They did so as volunteers and all the information provided was handled anonymously and confidentially. No impediment was placed if an individual wanted their contribution eliminated or if they wished to drop out. The study was carried out in accordance with the Declaration of Helsinki, and was approved by the Research Ethics Committee of the University of Malaga (PSI2017-84170-R).

#### Statistical analysis

The statistical analysis started with an exploratory study. A two-way ANOVA test was conducted to study the effect of gender and physical activity on mental health. Next, a confirmatory factor analysis was applied with the aim of extracting the two dimensions, adaptive emotional regulation strategies (AERS) and maladaptive emotional regulation strategies (MERS), which were subsequently used as mediators in the mediation analysis explaining the relationship between physical activity and mental health. The conceptual mediation model can be seen in Figure 1. The statistical analysis was conducted using R 4.0.2 (R Core Team, 2017) and SPSS 24. The macro PROCESS v3.5.3 by Andrew F. Hayes was used to estimate the mediation model (Hayes, 2018).

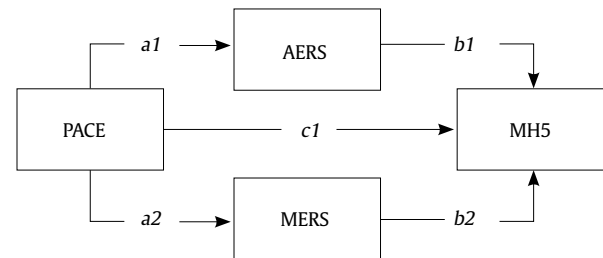


Figure 1. Conceptual mediation model.

## Results

### Descriptive statistics

Table 1 shows a summary of the descriptive statistics for the quantitative variables involved in the study.

Table 1

Descriptive statistics.

	n	Mean	SD	Min.	Max.
Positive Reappraisal (PosReap)	170	12.82	3.55	4.00	20.00
Refocussing on Planning (Planning)	170	14.26	3.40	4.00	20.00
Positive Refocussing (PosRef)	170	10.55	4.58	4.00	20.00
Acceptance (Accept)	170	13.88	2.84	6.00	20.00
Put in Perspective (PutPer)	170	12.96	3.47	4.00	19.00
Self-Blame (SelfBl)	170	11.72	2.88	5.00	20.00
Rumination (Rumin)	170	12.60	3.55	4.00	20.00
Catastrophizing (Catast)	170	9.65	3.51	4.00	20.00
Other-Blame (OtherBl)	170	8.49	2.88	4.00	20.00
PACE2	170	3.14	1.74	4.00	7.00
MH5	170	4.10	1.04	1.60	6.00

After detecting and eliminating three outliers, the sample contained 170 participants. The sample was balanced in relation to gender (51.2% boys and 48.8% girls) and biased towards engagement physical activity (81.8% for the whole sample, 90.8% and 72.3% for male and female subsamples). The average number of days participants engaged in physical education in a typical week (PACE2) was slightly higher than 3.

### Correlation analysis and ANOVA

Figure 2 shows the significant ( $p < 0.05$ ) correlation coefficients and the scatterplots for the quantitative variables involved in the study. As can be seen, MH5 correlates significantly and directly with some of the adaptive emotion regulation strategies and inversely with some of the maladaptive ones. Specifically, the following strategies present a significant and positive correlation with MH5: PosReap ( $r = 0.29$ ,  $t(168) = 3.90$ ,  $p < 0.001$ ), Planning ( $r = 0.28$ ,  $t(168) = 3.74$ ,  $p < 0.001$ ), and PosRef ( $r = 0.46$ ,  $t(168) = 6.77$ ,  $p < 0.001$ ). On the other hand, the following strategies present a significant but negative correlation with MH5: SelfBl ( $r = -0.28$ ,  $t(168) = -3.71$ ,  $p < 0.001$ ), Rumin ( $r = -0.16$ ,  $t(168) = -2.10$ ,  $p = 0.04$ ), and Catast ( $r = -0.33$ ,  $t(168) = -4.52$ ,  $p < 0.001$ ). MH5 also correlates directly with the variable related to the physical exercise, PACE2, ( $r = 0.18$ ,  $t(168) = 2.32$ ,  $p = 0.02$ ).

Next, we conducted the two-way ANOVA test to study the effect of gender and doing PA or not doing PA on MH5. Initially, the possible interaction effect between gender and PA was considered but was found to be non-significant ( $p = 0.73$ ). Consequently, a new

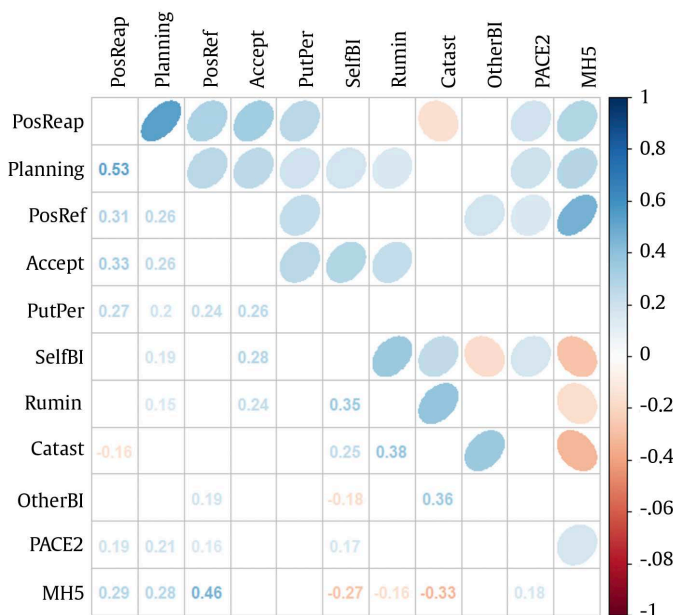


**Table 2**

Regression coefficients, standard errors, and model summary information for the mediation model.

Predictors	Outcome variables								
	AERS (M1)			MERS (M2)			MH5 (Y)		
	Coeff.	SE	p	Coeff.	SE	p	Coeff.	SE	p
Constant	-0.3587	0.1554	.0222	-0.0716	0.1585	.6519	3.8540	0.1431	.0000
PACE2 (X)	0.1144 (a1)	0.0434	.0091	0.0228 (a2)	0.0442	.6060	0.0777 (c1)	0.0401	.0544
AERS (M1)	---	---	---	---	---	---	0.3189 (b1)	0.0699	.0000
MERS (M2)	---	---	---	---	---	---	-0.4198 (b2)	0.0686	.0000
$R^2 = .0398$			$R^2 = .0016$			$R^2 = .2673$			
$F(1;168) = 6.965; p = .0091$			$F(1;168) = 0.267; p = .6060$			$F(3;166) = 21.123; p = .0000$			

model without crossed effects was specified. Both gender ( $F(1,167) = 7.38, p = 0.01, \eta^2 = 0.053$ ) and PA ( $F(1,167) = 9.30, p = 0.003, \eta^2 = 0.042$ ) were statistically significant factors with a medium effect size on MH5.

**Figure 2.** Correlation coefficients and the scatter plots for the quantitative variables implied in the study.

Regarding the Gender factor, the boys showed a significantly higher mean MH5 ( $M = 4.36, SD = 0.93$ ) than the girls ( $M = 3.82, SD = 1.08$ ). In the case of PA, adolescents who engaged in one or more physical activities show a significantly higher mean in MH5 ( $M = 4.23, SD = 0.99$ ) compared to those who did no sport ( $M = 3.49, SD = 1.06$ ). As the interaction is not significant, we can conclude that engaging in PA positively influences mental health regardless of gender.

### Mediation Model

Once the relationship between PA and MH5 had been proven, the question was whether the effect can be considered a direct effect or, as we hypothesized, it is mediated by the strategies the adolescents are able to implement to regulate their emotions.

Prior to the mediation analysis, two factors were obtained confirming there are two latent dimensions underlying the nine observed variables concerning adaptive and maladaptive strategies.

Following an Oblimin Rotation, the first factor, referred to as AERS, was found to be main and positively correlated with positive reappraisal, refocusing on planning, acceptance, positive refocusing and putting in perspective. On the other hand, the second factor (MERS) is main and directly related to catastrophizing, rumination, self-blame, acceptance and other-blame. The acceptance item was related to the two factors, although the relationship with the adaptive strategies factor was more significant.

Once the AERS and MERS factors had been extracted, they were used as mediators in the relationship between physical activity and mental health.

As can be seen in Table 2, Physical Activity (PACE2) presents a positive and significant coefficient in the model that explains the factor of AERS ( $a1 = 0.11, t(169) = 2.64, p = 0.01$ ). This is not the case for maladaptive strategies, for which the physical activity variable has no explanatory capacity ( $a2 = 0.02, t(169) = 0.52, p = 0.61$ ). With regard to the role of the AERS and MERS dimensions in explaining mental health, both variables are significant, and the signs of the coefficients are, as expected, positive in the case of adaptive strategies ( $b1 = 0.32, t(169) = 4.56, p < 0.001$ ), and negative in the case of maladaptive ones ( $b2 = -0.42, t(169) = -6.12, p < 0.001$ ).

Table 3 shows the results for the mediator role of emotional regulation strategies in the relationship between physical activity and mental health. The total effect of physical activity on mental health is positive and significant ( $coeff = 0.10, t(169) = 2.32, p = 0.02$ ). However, at a significance level of 5%, the same cannot be said for the direct effect ( $c1 = 0.08, t(169) = 1.94, p = 0.05$ ). Additionally, the indirect effects for the two mediators are different. In the case of AERS, this effect is significant and positive ( $a1*b1 = 0.04, BootCI = [0.0097; 0.0691]$ ), which means that the effect of physical activity on mental health is reinforced when adaptive strategies are involved. However, under the presence of MERS, the positive effect that physical activity might have on mental health fades, as shown by the non-significant indirect effect with a bootstrap confidence interval including the zero value ( $a2*b2 = -0.01, BootCI = [-0.0508; 0.0264]$ ).

**Table 3**

Total, direct and indirect effects of PACE on Mental Health.

	Effect	SE	p	LLCI	ULCI
Total	0.1046	0.0452	.0218	0.0154	0.1938
Direct	0.0777	0.0401	.0544	-0.0015	0.1569
Indirect	Effect	BootSE		BootLLCI	BootULCI
AERS (M1)	0.0365	0.0153		0.0097	0.0691
MERS (M2)	-0.0096	0.0193		-0.0508	0.0264

### Discussion

The results of this study confirm that adolescents that engage in one or more physical activities show higher mental health

compared to those that do not practice sports, and that doing physical activity positively influences mental health independently of gender. Regarding our hypotheses, we can confirm the effect of physical activity on adolescent mental health in the following way: Adaptive emotional regulation strategies exert a positive mediating effect on the relationship between physical activity and mental health in adolescents. That is, the positive effect of physical activity on adolescent mental health increases when adaptive emotional regulation strategies are also used, and the effect of physical activity on mental health is mitigated when maladaptive emotional regulation strategies mediate.

We should clarify that the predictive power of PA for mental health reported in the literature (Bernstein & McNally, 2018; Blough & Loprinzi, 2018; Korge & Nunan, 2018; Ogawa et al., 2019) should be qualified, considering the interrelation between covert and overt emotional regulation strategies. Therefore, the use of covert adaptive emotional regulation strategies would bolster the effect of PA but, however, would lose its predictive power when not accompanied by adaptive emotion regulation strategies. These results coincide with those found by Carroll (2014) in undergraduate victims of abuse, where emotional regulation strategies significantly predicted physical and psychological well-being, beyond the impact of child abuse or exercise. This result could also explain the findings of other studies, where the increase in physical activity does not exempt individuals from suffering certain mental or emotional disorders (Goodwin, Haycraft & Meyer, 2014; Lichtenstein et al., 2014; Dittmer, Jacobi & Voderholzer, 2018).

This result sheds much light on the process that underlies improving mental health. The repercussions of these results on the prevention of mental health are important, since emotion regulation strategies should be considered key in training or orienting the development of emotional adjustment in adolescents in the clinical or educational field. Meanwhile, overt emotional regulation strategies, such as physical exercise, should aim to improve specific covert regulating abilities, to thus enhance their mutual beneficial effects on mental health.

What then are the regulatory strategies with the greatest impact on mental health at this stage of development? We highlight, in our results, positive reappraisal as the most important adaptive regulation strategy, results that coincide with those in the review of previous studies (Chervonsky & Hunt, 2019; De France & Hollenstein, 2021). In contrast, catastrophizing was the most maladaptive emotional regulation strategy. These results would be justified, in accordance with the interpretation of Gross (2002), by the fact that suppression fails to decrease emotion experience and increases the physiological response in the case of catastrophizing, and effectively decreases the emotion experience in the case of reappraisal.

Furthermore, we have been able to verify that gender is also a differentiator in the greater mental health of men compared to women in this sample of adolescents, as the previous literature has shown in this respect (Aguilar-Velázquez et al., 2017; Evans, Grella & Upchurch, 2017; Magidson et al., 2017; Bailey, Howells & Glibo, 2018; Gitay et al., 2018; Sher et al., 2018; Özyurt et al., 2021). We should take these results with caution, however, since, as mentioned in the introduction, men show higher scores in other vital variables related to mental health, such as suicide rate or addictive behaviors (Aguilar-Velázquez et al., 2017; Evans, Grella & Upchurch, 2017; Sher et al., 2018). These results are influenced by cultural aspects, where the gender roles defined for men and women are differential in the expression and management of emotions (Sánchez-Núñez et al., 2008; Markus & Kitayama, 2010; Sung, 2010; Halberstadt & Lozada, 2011; Gibbons, Thorsteinsson & Loi, 2015).

Among the limitations of the results of this study, the sample size would be a factor to consider when carrying out generalizations to a larger population. Relatedly, as future research, it would be advisable to use populations of different cohorts to check the consistency of the results. Arguably, in our sample, where most adolescents did sports, engaging in physical activity was not a determining factor in mental health and other factors were more directly involved, as in the case of emotional regulation strategies.

It is worth noting that the results might be different in a sample of adults where there is a greater difference between those that do sports and those that do not, and where perhaps the emotion regulation strategies are more developed, either through training or experience. It would be interesting to investigate the effect of physical activity and ER strategies on mental health from a generational perspective.

Related to the above, carrying out longitudinal studies in which the practice of physical activity and the use of regulatory strategies are controlled for, would be a line that might provide greater clarity on the predictor variables of mental health and how they evolve. Another aspect that we consider important to highlight in future studies is how gender determines mental health and the factors involved in this relationship, among which would be differential training in emotion regulation strategies. In this sense, the key role of the family in the equal development of adaptive emotional regulation strategies in girls and boys must be highlighted (Finan et al., 2018).

## Conclusions

This study investigated the possible effect of physical activity on mental health when adaptive or maladaptive emotional regulation strategies are used. Our findings highlight the importance of adaptive emotional regulation strategies as a mediator that enhances the effect of physical activity on mental health. In contrast, maladaptive regulation strategies decreased the effect of physical activity on mental health. In other words, covert emotion regulation strategies would enhance the effect of overt strategies such as physical exercise. In conclusion, training and implementing effective regulation strategies with physical exercise programs in adolescents would be a priority objective in the design of programs to improve the health and well-being of this sector of the at-risk population. In this area, schools could be the first line of intervention for mental health, since they are a valuable environment for adolescents, and provide an accessible context for PA (Thorley, 2016).

In the family and the socio-educational sphere, early intervention is necessary so that children may reach adolescence with resources and skills to face the challenges that today's society requires.

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