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A mediated path from emotional intelligence to problematic social media use in adolescents: The serial mediation of perceived stress and depressive symptoms

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ABSTRACT

Online social networking is an intrinsic part of present life. However, if individuals believe that some basic psychological needs can only be fulfilled through social networking sites, an addictive pattern of usage may emerge. Problematic social media use (PSMU) is a growing concern in adolescence. The present study aimed at contributing to prior scientific literature by testing a model that considers low emotional intelligence (EI) as a vulnerability factor, perceived stress and depressive symptoms as affective and cognitive responses to conflicting situations, and PSMU as a maladaptive coping mechanism. In this study, 2068 Spanish adolescents (46.2% male, 53.8% female) within the ages of 12 and 19 ($M = 14.61$, $SD = 1.62$) completed self-report measures of the above-mentioned constructs. Results indicated that (a) perceived stress was a significant mediator in the association between EI and PSMU, (b) depressive symptoms were a significant mediator in this link, and (c) a significant serial mediation model was supported, in which lower EI predicted higher perceived stress, which contributed to higher levels of depressive symptoms, thus resulting in higher PSMU. These results provide important empirical evidence suggesting promising pathways towards preventing PSMU in adolescents, such as EI training, teaching stress-reduction techniques and focusing on reducing depressive symptoms.

1. Introduction

At present, online social networking is considered one important way of communicating and relating to others (Kuss & Griffiths, 2017). Social networking sites (SNS) are virtual communities where people create a personal profile, interact with known others and meet new people with similar interests (Kuss & Griffiths, 2017). Unquestionably, SNS are immensely useful for diverse personal, work, and educational purposes.

It has been proposed that SNS serve as a social resource to fulfill several psychological needs (Andreassen, 2015; Kuss & Griffiths, 2017). Nonetheless, if individuals believe that some basic psychological needs can only be fulfilled through SNS, a problematic pattern may emerge (Andreassen, 2015). Excessive use of SNS may lead to addictive-like symptoms (i.e., salience, mood modification, tolerance, withdrawal, relapse, and conflict; Andreassen, 2015). SNS addiction or problematic social media use (PSMU) can be defined as being overly concerned about social media, constantly checking for messages and updates and dedicating a lot of time to SNS, resulting in the impairment of several areas (Andreassen & Pallesen, 2014). PSMU differs from common or frequent SNS use in that the former is uncontrollable, compulsive, and leads to negative consequences (Andreassen, 2015).

The Interaction Person-Affect-Cognition-Execution (I-PACE) model of addictions (Brand et al., 2016; Brand et al., 2019) explains how a combination of different factors contributes to the development of Internet-related problems, such as PSMU. In short, this model proposes that personal core characteristics interact with certain affective and cognitive responses that may result in a problematic usage pattern of specific Internet-related applications. Moreover, the compensatory Internet use theory (CIUT; Kardefelt-Winther, 2014) states that people use certain online applications to compensate for an unfulfilled need from the offline life. The theories are complementary and may help explain different factors and motives that need to be considered to better understand PSMU.

1.1. Emotional intelligence and problematic social media use

The scientific literature suggests that people become addicted to a certain behavior to alleviate negative feelings, or as a mechanism to

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disconnect from emotions altogether (Andreassen, 2015). Consistent with the CIUT (Kardefelt-Winther, 2014), having difficulties in managing emotional situations in offline lives could launch people into overusing SNS and developing PSMU as a maladaptive coping mechanism. Furthermore, according to the I-PACE model (Brand et al., 2016; Brand et al., 2019), if these emotional difficulties are part of a person's core characteristics, it could set the base for developing PSMU and other Internet-related problems.

The present study aims at investigating emotional intelligence (EI) as a personal characteristic whose deficits might be associated with PSMU. EI is defined as the ability to perceive, understand, and manage emotions effectively (Mayer et al., 2016). EI has been consistently linked to subjective well-being (Sánchez-Álvarez et al., 2016) and mental health (Martins et al., 2010). Moreover, lower EI scores have been typically associated with substance-related addictions (Kun & Demetrovics, 2010; Pereira et al., 2019) and behavioral addictions, such as gambling (Parker et al., 2008), problematic Internet use (Arrivillaga et al., 2021; Saraiva et al., 2018), problematic smartphone use (Arrivillaga et al., 2020a; Arrivillaga et al., 2020b; Díaz & Extremera, 2020), and problematic gaming (Che et al., 2017). Recently, research has also focused on exploring different pathways that link EI and PSMU (Granados et al., 2020; Kircaburun et al., 2019; Marino et al., 2020; Süral et al., 2019). Results suggest that EI is negatively associated with PSMU. In this study we aim at contributing to this growing scientific literature by further exploring the direct and indirect links between EI and PSMU.

1.2. The mediating roles of perceived stress and depression

According to the CIUT (Kardefelt-Winther, 2014), PSMU might be a coping mechanism used by people to handle difficult situations. In addition, the I-PACE model (Brand et al., 2016; Brand et al., 2019) proposes that affective and cognitive processes are among the explaining mechanisms of Internet-related disorders. For example, perceived stress refers to the emotional experience of life as unpredictable, uncontrollable, or overloaded (Cohen et al., 1983). In short, levels of perceived stress might be one of the mediating variables that clarify the link between a personal characteristic, such as EI, and PSMU. Evidence suggests that lower EI is linked to higher levels of perceived stress (Ruiz-Aranda et al., 2014; Urquijo et al., 2016). Moreover, stress is significantly linked to PSMU (Hou et al., 2017; Hussain & Griffiths, 2019). Thus, evidence supports the proposal of a mediating effect of stress in the association between EI and PSMU.

Similarly, depressive symptoms might be one of the affective and cognitive factors that would explain why distressed people excessively use SNS to manage difficult situations. In fact, some studies have suggested that depressive symptoms are predictors of PSMU (Bányai et al., 2017; Granados et al., 2020; Kircaburun et al., 2019). In addition, empirical evidence suggests that higher EI levels are related to lower depressive symptoms (Davis et al., 2019; Gomez-Baya et al., 2016; Lombas et al., 2014). Therefore, previous findings also support a mediation hypothesis from EI to PSMU via depressive symptoms. Considering the I-PACE framework (Brand et al., 2016; Brand et al., 2019), self-reported depressive symptoms might be typical cognitive responses to concurrent affective states of overwhelm or overload (i.e., perceived stress) (Hammen, 2005; Van Praag, 2004). Consequently, our study aims at testing a serial mediation model that includes both stress and depressive symptoms as affective and cognitive processes, respectively.

1.3. The present study

We aim at contributing to the prior expanding scientific literature by testing the interrelationship between EI, perceived stress, depressive symptoms, and PSMU in adolescents.

Drawing on the I-PACE model and the CIUT, the current study focuses on the role of perceived stress and depressive symptoms as serial mediators linking EI and PSMU. Consistent with these theoretical approaches and based on previous findings in the literature, we hypothesized the following:

H1: EI negatively correlates with perceived stress, depressive symptoms, and PSMU.

H2: There is an indirect effect of EI on PSMU through perceived stress (H2a) and depressive symptoms (H2b).

H3: The relationship between EI and PSMU will be serially mediated by perceived stress and depressive symptoms.

2. Methods

2.1. Participants

Participants were 2068 adolescents (46.2% male, 53.8% female), within the ages of 12 and 19 ($M = 14.61$, $SD = 1.62$) who attended different schools in southern Spain. The majority were of Spanish nationality (96.7%). Concerning grade level, 34.1% of them were in 9th grade (3rd year of secondary education), 27.1% studied in the 10th grade (4th year of secondary education), 18.5% were in the 11th grade (1st year of baccalaureate), 18.8% in the 12th grade (2nd year of baccalaureate) and 1.4% were in vocational education (professional training). The sample for this study is part of a larger project of the research group PPIT.UMA.B1.2017/23.

2.2. Measures

2.2.1. Emotional intelligence (EI)

EI was assessed with the validated Spanish version of the Wong & Law Emotional Intelligence Scale (WLEIS: Extremera et al., 2019; Wong & Law, 2002). The WLEIS includes 16 items measured in a 7-point Likert scale (e.g., "I am able to control my temper and handle difficulties rationally"). All items are averaged and higher scores indicate higher EI. In our sample, the alpha reliability coefficient was 0.88 and the McDonald's omega coefficient was 0.88, in line with prior studies with Spanish samples (Extremera et al., 2019).

2.2.2. Stress

Perceived stress was assessed using a short version of the Perceived Stress Scale (PSS: Cohen et al., 1983; Cohen & Williamson, 1988). This version consisted of four items that were answered by adolescents based on a 5-point Likert scale ranging from 1 (never) to 5 (very often). An example of an item is "How often have you felt that you were unable to control the important things in your life?". In our sample, the alpha coefficient was 0.52 and McDonald's omega was 0.53. Prior studies with the original PSS have shown to demonstrate similar reliability indexes with an α coefficient of 0.60 (Cohen & Williamson, 1988).

2.2.3. Depressive symptoms

Depressive symptoms were assessed with a subscale of the Depression, Anxiety and Stress Scale (DASS-21: Lovibond & Lovibond, 1995; Spanish version: Bados et al., 2005). The depression subscale is composed of seven items that adolescents answer in a 4-point Likert scale that ranges from 0 (does not apply to me at all) to 3 (applies to me very much or most of the time). The DASS-21 measures the severity and frequency of symptoms, so a higher score expresses worse symptomatology (e.g., "I had no positive feelings"). In our sample the internal consistency was $\alpha = 0.90$; $\omega = 0.90$. Bados et al. (2005) found supporting evidence for the validity of the DASS-21 in a Spanish sample.

2.2.4. Problematic social media use (PSMU)

PSMU was measured using the Social Media Addiction Questionnaire (SMAQ; Hawi & Samaha, 2017). The SMAQ is composed of eight items scored on a 7-point Likert scale that ranges from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate worse PSMU. An example of an item is "I have been unable to reduce my social media use." We used

the Spanish translated version of Granados et al. (2020). Evidential support for the SMAQ's validity can be found in Hawi and Samaha (2017). Furthermore, in the test battery for the larger project (PPIT.UMA.B1.2017/23) it was found that SMAQ scores were positively associated with problematic smartphone use ($r = 0.79$, $p < 0.01$), problematic internet use ($r = 0.62$, $p < 0.01$), and psychological distress ($r = 0.31$, $p < 0.01$), and negatively correlated to satisfaction with life ($r = -0.20$, $p < 0.01$). Concerning reliability, in our sample the alpha coefficient was 0.87 and McDonald's omega index was 0.87.

2.3. Procedure

The research protocol and data collection were in accordance with current ethical standards (World Medical Association, 2013). First, school administrators were invited to participate in the study. Second, parental consent was obtained on behalf of the adolescents. Third, data collection took place within school hours and students were informed that their participation was voluntary. All the students agreed to participate. However, two exclusion criteria were considered: the adolescents had to have a fluent understanding of the Spanish language and a parent had to express consent. In addition, participants were told that the information they provided was anonymous, confidential, and would be used only for research purposes.

2.4. Data analysis

IBM SPSS Statistics 23.0 was used to conduct the analyses (SPSS Inc., Chicago, IL, USA). Initially, descriptive statistics of all study variables and Pearson bivariate correlations between the evaluated dimensions were analyzed. Furthermore, Harman's single factor test (Podsakoff & Organ, 1986) was used to test for common-method bias, since all measures were self-report questionnaires. Common-method bias is present if an exploratory factor analysis shows that a single factor accounts for most of the variance (Podsakoff & Organ, 1986).

The mediation analyses were conducted using the PROCESS macro (Hayes, 2018). We tested for OLS regression assumptions (independence, normality, multicollinearity, and homoscedasticity) before conducting the analyses. Results showed that the last assumption was not met, so heteroscedasticity consistent standard error (HC3) estimators were used. First, simple mediation analyses were performed using PROCESS' model 4 to examine perceived stress and depressive symptoms as mediators of the association between EI and PSMU, separately. Second, model 6 was used to test the serial mediation hypothesis, exploring EI as the independent variable, perceived stress as the first mediator, depressive symptoms as the second mediator, and PSMU as the outcome variable. In all the analyses, age and gender were entered as covariates, as prior studies have found a significant effect on PSMU (Kuss & Griffiths, 2017). Bias-corrected 95% confidence intervals (95% CI) were estimated using 5000 bootstrapping samples. An effect was considered significant if the 95% CI did not include zero.

Table 1
Descriptive statistics and correlations between study variables.

	M	SD	1	2	3	4
1. EI	4.77	1.00	–			
2. Perceived Stress	2.08	0.75	−0.40**	–		
3. Depressive Symptoms	0.76	0.78	−0.30**	0.56**	–	
4. PSMU	24.32	10.95	−0.14**	0.33**	0.27**	–

Note: $N = 2062$. EI = emotional intelligence. PSMU = problematic social media use. ** $p < 0.01$.

3. Results

3.1. Preliminary analyses

Means, standard deviations, and Pearson correlations are presented in Table 1. Consistent with hypothesis 1, EI showed negative associations with perceived stress, depressive symptoms, and PSMU. Moreover, perceived stress, depressive symptoms, and PSMU were positively and significantly correlated between them ($p < 0.01$).

Common-method bias was assessed using the Harman's single factor test (Podsakoff & Organ, 1986). The exploratory factor analysis showed that there were six factors with eigenvalues higher than 1, and the first factor accounted for 23.5% of the variance, so common-method variance was not an issue in our study.

3.2. The mediating roles of stress and depression

PROCESS' model 4 was used to conduct simple mediation analysis to test for the indirect effect of stress in the association between EI and PSMU. After controlling for age and gender, EI was significantly related to stress (B = -0.29, SE(HC3) = 0.01, $p < 0.001$), which was positively associated with PSMU ($B = 3.45$, SE(HC3) = 0.34, $p < 0.001$). The negative direct effect of EI on PSMU became not significant (B = -0.37, SE(HC3) = 0.25, $p > 0.05$). Therefore, perceived stress mediated the association between EI and PSMU (indirect effect = -1.03, BootSE = 0.11, *95% CI* [-1.27, −0.80]) supporting hypothesis 2a. The complete model was significant ($p < 0.001$) and accounted for 14.7% of the variance in PSMU.

The same procedure was used to assess the indirect effect of depressive symptoms in the association between EI and PSMU. After controlling for the effect of gender and age, EI showed a negative and significant association with depressive symptoms (B = -0.23, SE(HC3) = 0.17, $p < 0.001$). Similarly, depressive symptoms were significantly and positively linked to PSMU ($B = 2.29$, SE(HC3) = 0.33, $p < 0.01$). The residual direct effect of EI on PSMU remained significant (B = -0.76, SE(HC3) = 0.24, $p < 0.01$). Hence, depressive symptoms partially mediated the association between EI and PSMU (indirect effect = −0.62, BootSE = 0.09, 95% CI [−0.81, −0.45]), supporting hypothesis 2b. The mediation model was statistically significant ($p < 0.001$) and accounted for 14.6% of the variance in PSMU.

3.3. Exploring the multiple mediation model

PROCESS' model 6 was used to test the serial multiple mediation hypothesis. Results showed a significant total effect of EI on PSMU (B = -1.39, SE(HC3) = 0.23, $p < 0.001$). In Fig. 1 and at the top of Table 2, the coefficients for the direct effects in the model are presented. As shown, all the direct effects were significant ($p < 0.001$), except for the residual effect of EI on PSMU ($B = -0.25$; $p > 0.05$). Moreover, since the 95% bootstrap confidence intervals did not contain zero, the lower part of Table 2 shows that all the indirect effects were also statistically significant. That is, first, perceived stress mediated the association between EI and PSMU (indirect effect = −0.78, BootSE = 0.12, 95% CI [−1.04, −0.55]). Second, depressive symptoms mediated the link between EI and PSMU (indirect effect = -0.11, BootSE = 0.04, 95% CI [−0.20, −0.04]). Third, perceived stress and depressive symptoms sequentially mediated the path from EI to PSMU (indirect effect = −0.23, BootSE = 0.06, 95% CI [−0.35, −0.12]). In sum, lower EI was associated with higher perceived stress, which, subsequently, was positively associated with more depressive symptoms. Finally, higher depressive symptoms were positively related to higher PSMU in adolescents. This result supports hypothesis 3. The serial multiple mediation model accounted for a significant proportion of the variance in the adolescents' PSMU ($R^2 = 0.14$, $p < 0.001$).

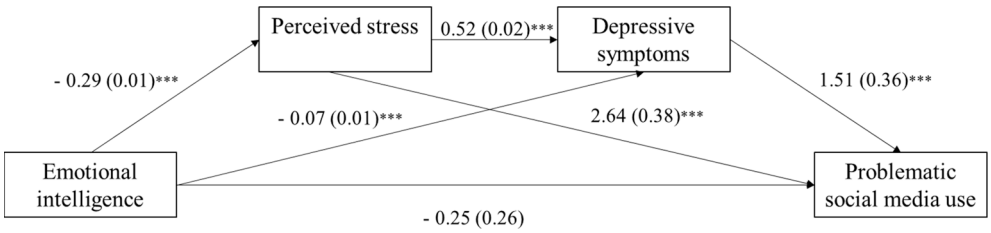

Fig. 1. The serial multiple mediation model. Paths' coefficients are shown with heteroscedasticity consistent standard error in parenthesis. Age and gender were covariates in the model but are not included for simplicity reasons. *** $p < 0.001$.

Table 2
Effects in the multiple mediation model.

	B	*SE (HC3)*	LLCI	ULCI
Direct effects				
EI → perceived stress	−0.29***	0.01	−0.33	−0.26
EI → depressive symptoms	−0.07***	0.01	−0.11	−0.03
Perceived stress → depressive symptoms	0.52***	0.02	0.48	0.57
Perceived stress → PSMU	2.64***	0.38	1.89	3.40
Depressive symptoms → PSMU	1.51***	0.36	0.79	2.23
EI → PSMU	−0.25	0.26	−0.76	0.25
EI → PSMU (total effect)	−1.39***	0.23	−1.86	−0.92
Indirect effects	Boot Effect	Boot *SE*	Boot LLCI	Boot ULCI
EI → perceived stress → PSMU	−0.78	0.12	−1.04	−0.55
EI → depressive symptoms → PSMU	−0.11	0.04	−0.20	−0.04
EI → perceived stress → depressive symptoms → PSMU	−0.23	0.06	−0.35	−0.12

Note. $N = 2042$. EI = emotional intelligence. PSMU = problematic social media use. *B* = unstandardized coefficient; *SE* (HC3) = Heteroscedasticity Consistent Standard Error; LLCI = 95 % lower limit confidence interval; ULCI = 95 % upper limit confidence interval. *** $p < 0.001$. Boot = statistics for the indirect effects are the result of the bootstrapping method. Covariates: age and sex.

4. Discussion

The aim of our study was to contribute to the growing literature by expanding our understanding about implied mechanisms in the development of technology-related problems. Specifically, we tested a serial multiple mediation model to predict PSMU. We found supporting evidence to suggest that lower EI was associated with higher PSMU, and that this relationship is explained by increased perceived stress and, subsequently, more depressive symptoms.

According to the I-PACE model, some individual core characteristics could be either protective or vulnerability factors for developing Internet-related problems. Furthermore, PSMU could be considered a maladaptive coping mechanism that people use to manage situations that they are unable to control in their offline everyday life (Kardefelt-Winther, 2014). Therefore, adolescents with decreased levels of EI might be more inclined to use external forms of regulation to relieve distress, such as PSMU. For instance, adolescents who do not have the skills to manage negative emotions associated with stressful situations might seek distraction and avoid related unpleasant feelings by using SNS but end up experiencing negative mood modification (Marino et al., 2020). Our results support this claim, since we found a significant total effect of EI on PSMU, in accordance with previous studies (Granados et al., 2020; Marino et al., 2020; Süral et al., 2019).

Nonetheless, upon further exploring this effect, we found that perceived stress and depressive symptoms separately mediated the association between EI and PSMU, confirming hypotheses 2a and 2b. Regarding stress, preceding studies have proposed that emotionally intelligent people tend to better understand, regulate and use emotional information to cope with emotional problems, subsequently reducing the intensity of stressors and providing a higher sense of control over their environment (Ruiz-Aranda et al., 2014; Urquijo et al., 2016). However, if adolescents do not have these skills, they may overuse SNS as a mechanism to relieve stress or to satisfy the need to escape from stressful real-life situations (Hou et al., 2017; Hussain & Griffiths, 2019). Furthermore, it has been suggested that lower EI contributes to depressive symptoms by a reduction in emotional self-efficacy and the use of ineffective strategies to cope with distress (Gomez-Baya et al., 2016). As well, youths who are unable to perceive emotional signals accurately may have unsuccessful interactions with others, which might prolong negative mood and subsequently lead to increased depressive symptomatology (Davis et al., 2019). Accordingly, depressed adolescents may prefer online interactions and use SNS to cope with everyday issues, which could increase the likelihood of PSMU (Kuss & Griffiths, 2017). Another explanation could be that depressed adolescents are more prone to boredom, which could increase their vulnerability for PSMU (Elhai et al., 2018; Kircaburun et al., 2019).

Moreover, our findings from the serial mediation model support an underlying serial mechanism that leads to PSMU, based on the I-PACE framework (Brand et al., 2016; Brand et al., 2019). In fact, prior evidence also supports our findings establishing stress as a predictor of depressive symptoms (Maydych, 2019; Park et al., 2019; Van Praag, 2004). Therefore, our study supports the notion that adolescents who report decreased EI may experience situations as overwhelming or unpredictable and, in turn, these feelings may make them have pessimistic, helpless, or demotivating thoughts. Finally, adolescents may try to overcome these unpleasant emotions by excessively using SNS.

Our study is not without limitations. First, even though the serial mediation model was based on theoretical grounds (Brand et al., 2019), the cross-sectional nature of our data does not allow us to imply causality between the variables. Regarding this issue, past studies have reported findings in both directions, suggesting that it is not yet clear whether stress and depression are a risk factor of PSMU (e.g., Brailovskaia et al., 2018; Raudsepp, 2019), a consequence (e.g., Chen, 2020; Vernon et al., 2017) or both (Elhai et al., 2017). Future longitudinal studies may help clarify the directionality of the researched processes. Second, we used self-report questionnaires, which might be susceptible to a social desirability bias. The use of ability measures of EI (Mayer et al., 2016) and clinical assessments of depression in future studies may help reduce this bias. Finally, the reliability indexes obtained for the PSS-4 have been less than ideal, despite these results being similar to the Cronbach's alpha reliabilities found in other studies using the original short version of the perceived stress scale (PSS-4; Cohen & Williamson, 1988). Further studies might also consider the inclusion of longer perceived stress scales to generalize our findings.

Despite the above-mentioned limitations, our results have important implications for the understanding of PSMU. The fact that we focused on different predictors of PSMU provides several pathways to reduce this problematic use of technology in adolescents. First, even though EI is considered a relatively stable feature, evidence shows that it can be trained (Kotsou et al., 2019; Mattingly & Kraiger, 2019). Clinical and educational researchers and practitioners may find that training EI abilities could help tackle what could be an underlying cause of PSMU by helping adolescents manage their levels of perceived stress in relation

to serious negative life events, as well as the negative emotions associated with them in order to reduce their need to cope using SNS. In addition, programs aimed directly at reducing stress levels and depressive symptoms could be another promising path toward decreasing the probability of PSMU in adolescents. Interestingly, technology-based instruction for emotional intelligence has been previously used as a tool for fostering emotional abilities (Goldsworthy, 2002). For example, several intervention programs have used digital technology applications, such as immersive virtual reality (Hadley et al., 2019), augmented reality (Ruiz-Ariza et al., 2018), interactive multimedia (Nakpong & Chanchalor, 2019) and videogames (Cejudo et al., 2019, 2020; De la Barrera et al., 2021) suggesting potential uses of computer technology to support the development of emotional intelligence and for improving adolescent well-being.

5. Conclusion

The present study contributes to the growing literature attempting to better understand some of the personal characteristics and negative affective reactions associated with Internet-related problems. Specifically, we provided evidence to suggest that EI exerts an indirect effect on PSMU via perceived stress and depressive symptoms, separately. Furthermore, the most important finding provides empirical support for the I-PACE model for SNS addiction, as our results suggest a significant serial mediation in which decreased EI is associated with higher perceived stress, which contributes to more depressive symptoms, resulting in higher PSMU in adolescents. Therefore, prevention programs for PSMU in youths could target training in EI, teaching stress-reduction techniques, and alleviating depressive symptoms.

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CRediT authorship contribution statement

Christiane Arrivillaga: Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing. **Lourdes Rey:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing - review & editing. **Natalio Extremera:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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