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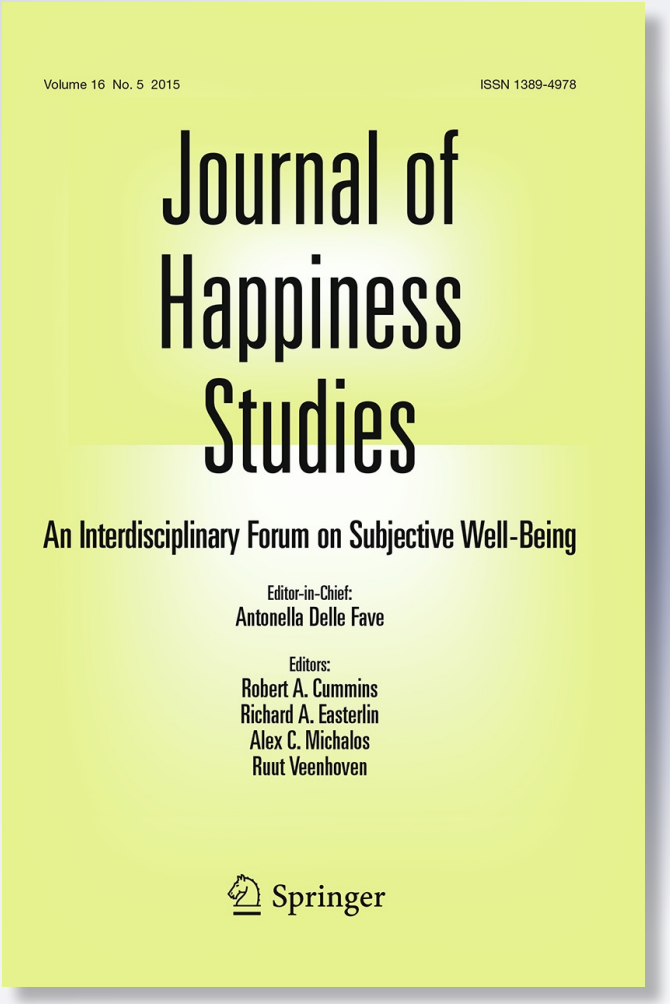


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RESEARCH PAPER

# The Mediating Role of Relatedness Between Repair and Loneliness: A Preliminary Model in High School Students

**José Martín-Albo · Andrés S. Lombas · Teresa I. Jiménez · Sonsoles Valdivia-Salas · Juan L. Núñez · Jaime León**

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**Abstract** Research has shown that loneliness may impair mental health and psychosocial adjustment during adolescence. There is separate evidence of the role of relatedness and emotional repair as predictors of perceived loneliness during adulthood. The objective of the present study was to analyze the mediating role of relatedness between emotional repair and loneliness in high school students. The sample included 703 students attending five different schools. Results of a simple mediation analysis seemed to support the mediating role of relatedness. However, since the interaction between emotional repair and relatedness was significant, a moderated mediation was conducted, which showed that the proposed mediation was dependent on the levels on repair and relatedness. Specifically, relatedness only had a mediating role when the levels of relatedness were low and the levels of repair were high. These and other results point to a more complex relation between emotional repair, relatedness, and loneliness than initially expected. We discuss our findings in relation to Salovey and Mayer's (Imagin Cognit Personal 9(3):185–211, 1990) theory of emotional intelligence and the basic psychological needs theory (Deci and Ryan in Psychol Inq 11:227–268, 2000).

**Keywords** Emotion regulation · Adolescence · Basic psychological needs · Social adjustment

## 1 Introduction

Approximately, 30 % of adolescents suffer from loneliness (Al Khatib 2012; Brennan 1982; Knox et al. 2007; Larson 1999), which usually results from a difficulty in establishing and maintaining satisfactory interpersonal relationships (Baumeister and Leary

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1995; Cacioppo et al. 2000; Chipuer 2001). Adolescence is a period of life where relationships with the peers acquire a specific relevance. As a matter of fact, adolescents spend more time with peers than ever before and they seek to meet specific social needs such as interpersonal intimacy (Selman 1980). Therefore, relationships with peers during adolescence are key for the proper socio-emotional development. Furthermore, we know that loneliness is related with the presence of cardiovascular disease, eating and sleep disorders, depression, suicide, substance and alcohol abuse, and violent behavior (Cacioppo et al. 2003; Carvajal-Carrascal and Caro-Castillo 2009; Heinrich and Gullone 2006; Lauder et al. 2004; Moreno Ruiz et al. 2009), turning its presence during adolescence into a serious risk for the adolescents' mental health and social adjustment (McWhirter 1990). These facts have encouraged researchers to define loneliness and its precipitating factors during this developmental stage, so as to design effective prevention programs (Mahon et al. 2006).

Loneliness is a subjective experience that includes a disagreeable emotional experience and a cognitive self-perception of social inadequateness (Heinrich and Gullone 2006). The cognitive discrepancy model of loneliness (Peplau and Perlman 1982) proposes that loneliness occurs when there is a discrepancy between the current and the desired levels of interpersonal relations. This leads to the distinction between perceived loneliness and social isolation. While the former refers to the perceived quality of the interpersonal relations, regardless of the amount of those; the later means the absence of interpersonal relations (Asher and Paquette 2003; Cutrona 1982; Russell et al. 2012; Wheeler et al. 1983). In line with this, people may report having a small social network and still score low in loneliness because the perceived quality of such network satisfies their needs (e.g., Fischer and Phillips 1982).

Research on the predictors of loneliness has been carried out within different theoretical frameworks, with little convergence between them. One of these is Self-Determination Theory (SDT; Deci and Ryan 2000), which proposes that loneliness occurs when the three basic psychological needs, namely autonomy, competence, and relatedness, are not fulfilled. The three basic psychological needs are innate, universal and essential for growth, well-being and personal and social development, regardless of gender, social class or cultural context (Vansteenkiste et al. 2010). The need for autonomy refers to the experience of will and psychological freedom, and is determined by the level of external pressure when performing an action (Deci and Ryan 1985). The need for competence implies that individuals need to interact effectively with their environment in order to feel capable enough to produce desired outcomes and prevent undesired ones (Connell and Wellborn 1991). Finally, the need for relatedness refers to the desire to feel connected with, and mutually supportive of significant others (Deci and Ryan 1985). There is evidence that the fulfillment of the three basic psychological needs is negatively and significantly correlated to loneliness in adults (e.g., Wei et al. 2005). More specifically, out of the three basic psychological needs, the fulfillment of the need for relatedness exhibited the highest negative correlation with the three loneliness indicators used in the UCLA Loneliness Scale (Russell 1996).

While the SDT presents an appropriate theoretical framework to explain loneliness from a social and motivational approach, emotional intelligence theories have offered an appropriate theoretical framework to address the emotional aspects of loneliness. As defined by Mayer and Salovey (1997), emotional intelligence (EI) involves the ability to (a) accurately perceive, appraise, and express emotion; (b) access and/or generate feelings that facilitate thought; (c) understand emotion and emotional knowledge; and (d) regulate emotions in order to promote emotional and intellectual growth.

Research within the emotional intelligence theoretical framework, has found two important findings. On the one hand, emotional intelligence in adolescents is positively

related to social connections (Augusto-Landa et al. 2011; Brackett et al. 2010; Lopes et al. 2003, 2004, 2011). On the other hand, emotional intelligence is negatively related to the feeling of loneliness (Chapman and Hayslip 2005; Engelberg and Sjöberg 2004a, b; Sjöberg 2008; Saklofske et al. 2003), even after controlling for other variables, such as personality traits (Engelberg and Sjöberg 2004a). That is, people that are emotionally intelligent have the perception of being connected with others and do not feel lonely.

The Trait Meta-Mood Scale (TMMS; Salovey et al. Palfai (1995) is one of the most widely used self-report measures of EI. TMMS measures the knowledge that individuals have about their own emotional abilities (Salovey et al. 2002). Specifically, TMMS assesses *Emotional Attention, or* the amount of attention paid to one's own emotional states; *Emotional Clarity*, or the understanding of one's emotional states; and *Emotional Repair*, or the ability to regulate one's emotional states). Emotional repair is associated with the ability to control intrusive and ruminative thoughts that often accompany stressful situations (Salovey et al. 1995), which has been frequently linked to various aspect of psychosocial adjustment (Extremera et al. 2007; Thompson et al. 2007).

All in all, research mainly conducted with adults and within separate theoretical frameworks, namely SDT and emotional intelligence theories, has shown that (1) when people have the ability to regulate emotions, the likelihood of establishing warm and close relationships with others increase, and feelings of loneliness decrease; and (2) when people feel connected with others, feelings of loneliness decrease. Considering that relatedness, from the SDT point of view, is a way of perceiving the relationships with others, our purpose was to explore the mediational role of relatedness in the relation between emotional repair and loneliness with a sample of high school students. Following previous evidence, we hypothesized a positive relation between repair and relatedness, and a negative relation between relatedness and loneliness. In other words, we predicted that adolescents who had the ability to change their emotions would tend to perceive that their need for social interactions with others was fulfilled, and consequently, would not feel lonely. Contrarily, adolescents who did not have the ability to modify their emotions would perceive themselves as needing connectedness with others, and consequently, would feel lonely.

## 2 Method

### 2.1 Participants

A total of 703 students (350 male and 353 female) with ages ranging between 12 and 17 years (Mean = 14.0; SD = 1.42) participated. Participants were attending classes in one of the four grades of secondary education (21.6, 18.8, 32.2 and 27.4 % were in first, second, third and fourth year, respectively). Of these five secondary schools, the first three were in the capital and the rest in its surroundings. All secondary schools that participated in the study were in urban areas (town populations were over 2,000 people), except for one, which was in a rural area.

### 2.2 Procedure

We contacted the principal of each school to explain the purpose of the research and to request permission to carry out the study in the educational institution. Once we had obtained the permission of the school principals, we requested consent for the students to participate in this study from their guardians. We then explained the goals of the study to

the students, and informed them that participation was voluntary and confidential. This was done to avoid the possible effect of social desirability. At least one researcher was present during the administration of the instruments to provide students with the necessary support to successfully complete the instruments.

## 2.3 Measures

### *2.3.1 Relatedness*

Students completed the five items of the Spanish version the Psychological Needs Scale (Gillet et al. 2008; Spanish-language version by León et al. 2011) regarding students' need for relatedness. These items measured relatedness among students (e.g. "I feel appreciated and valued by my colleagues") and were evaluated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree).

### *2.3.2 Repair*

We used the seven items of the Trait Meta Mood Scale (Fernández-Berrocal et al. 2004) which assesses the belief that one can repair a bad mood (e.g. "Although I am sometimes sad, I have a mostly optimistic outlook"). Our version was modified in line with Martin-Albo et al. (2010) resulting in the removal of item 23 ("I have lots of energy when I am happy"). Response options ranged from 1 (strongly disagree) to 7 (strongly agree).

### *2.3.3 Loneliness*

Most studies of factor structure of the UCLA Loneliness Scale Version 3 (Russell 1996) have obtained a three-factor solution (e.g., Austin 1983; Dussault et al. 2009; Hartshore 1993; Hawkley et al. 2005). As described by Dussault et al. (2009), the first factor, composed of negatively worded items and labelled Isolation, reflects feelings of rejection and loneliness (e.g., "I feel left out" and "I feel isolated from others"). The second factor, composed of positively worded items and labelled Relational Connectedness, corresponds to feelings of intimacy (e.g., "I feel close to people"). The last factor, consisting of positively worded items and dealing with feelings of group identification, was labelled Collective Connectedness (e.g., "I feel part of a group of friends"). In this study only Isolation subscale was examined for two reasons: (1) even though previous research has shown that the three-factor solutions is the best solution, the model not always provides a good fit to the data (e.g., SRMR = .10 in Hartshore 1993), and (2) the focus of the present work is to examine the relation between emotional and motivational aspects and the feeling of loneliness. We used the Spanish version of UCLA Loneliness Scale Version 3 (Russell 1996) adapted by Expósito and Moya (1999). The response format was a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Thus, similarly to Hartshore (1993), original anchored scale from "Never" to "Often" was changed to "Strongly disagree" to "Strongly agree" to avoid confusion with certain items.

## 2.4 Data Analysis

Firstly, univariate (means and standard deviations) and bivariate statistics (correlations) were computed using SPSS (Version 20.0) using the bootstrap method with 1,000 samples. After descriptive statistics, multivariate inferential analyses were conducted using

structural equation modeling (SEM). SEM was performed through Mplus 6.01 software (Muthén and Muthén 2010). Analysis were performed with maximum likelihood parameter estimates with standard errors and Chi square test statistics robust to non-normality and non-independence of observation owned to clustering (Muthén and Muthén 1998–2010, p. 9). For all analyses, a $p$ value of $<.05$ was employed for a result to be considered significant. The SEM was performed following a two-step process. First, to assess the psychometric properties of the instruments, a measurement model was performed through a confirmatory factor analysis. Posterior to the measurement model, three different analyses were performed.

The first analysis consisted on a simple mediation analysis. This was done by following the causal steps approach (see Holmbeck 1997; MacKinnon et al. 2002, for a complete explanation), the most widely used method to test for mediation (MacKinnon 2008). According to this approach, a variable must meet the following conditions to be considered a mediator: (a) the fit of the overall model when the dependent variable, C, is regressed on the predictor, A, has to be good (A-C model), and the A-C path coefficient has to be significant, (b) the fit of the overall model when the dependent variable, C, is regressed on the mediator, B, and the mediator is simultaneously regressed on the predictor, A, has to be good (A-B-C model), and the A-B and the B-C path coefficients have to be significant, (c) there must not be a significant improvement in fit when comparing A-B-C model when the A-C path coefficient is unconstrained (Unconstrained A-B-C Model), respective to when this path coefficient is constrained at zero (Constrained A-B-C Model). In order to obtain a significance test of the comparison of these two structural models, a Loglikelihood Chi Square Difference Test was performed. The satisfaction of this condition proves complete mediation. If this condition is not satisfied and one wants to test partial mediation (the most common case), then a test of significance of the indirect effect has to be performed. In our study, we evaluated this condition (referred as condition d) independently of the result in the condition c, since it provides an index of the magnitude of the mediational effect. When condition c was satisfied, indirect effect was calculated on the Constrained A-B-C Model, otherwise the indirect effect was calculated on the Unconstrained A-B-C Model. Since the satisfaction of condition c indicates a non-significant A-C path coefficient, the calculation of the indirect effect in the Constrained A-B-C model should lead to a model with higher statistical power, respective to the Unconstrained A-B-C model, as consequence of having one parameter less. To perform the test of the indirect effect, its confidence intervals were calculated using the bootstrap method with 2,000 samples.

An important condition for demonstrating simple mediation is to rule out an interaction between the independent variable and the mediator (MacKinnon 2008). Because of this, after the simple mediation analysis, an interaction analysis was carried out. To analyze the interaction, we used the latent moderated structural model approach proposed by Klein and Moosbrugger (2000). Although certain approaches to the estimation of latent interactions require the formation of product indicators for a new latent interaction factor, Klein and Moosbruggeŕs approach estimates the interaction effect from the first-order or main effect factor indicators without creating a new latent variable. Simulation studies showed that this approach provides efficient parameter estimators as well as unbiased standard errors (Klein and Moosbrugger 2000; Schermelleh-Engel et al. 1998).

Finally, since results showed that simple mediation analysis had a good fit and interaction analysis revealed a significant interaction between the independent variable and the mediator, a moderated mediation analysis was performed. To perform the moderated mediation analysis the independent variable and the moderator were dichotomized to generate two different groups. This was done by splitting them in two groups with high and

low levels, using the median as cut point. Once the independent variable and moderator were dichotomized, a mediation analysis, following the causal steps approach, was carried out for each group of the independent variable and of the moderator. Throughout the whole study, path coefficients reported were standardized values, except for the interaction analysis since these are not available when Klein and Moosbruggeŕs approach is used. Path coefficients magnitudes were interpreted according to guidelines offered by Cohen (1988, 1992) and were accompanied by their confidence intervals.

A model would be considered to have a good fit when RMSEA, its upper confidence interval and SRMR values were lower than .08 (see Browne and Cudeck 1993; Hu and Bentler 1998, 1999), and when CFI value was higher than .90 (Marsh et al. 2004). Although a Chi square test for model fit was also reported, it was not used to evaluate model fit for its sensitivity on large sample sizes. In the interaction analysis the fit of the models was not evaluated, since when Klein and Moosbruggeŕs (2000) approach is used to analyze interaction goodness-of-fit indices cannot be calculated.

## 3 Results

### 3.1 Descriptive Statistics

Table 1 shows the descriptive statistics of the observed variables of the study. Based on Likert scale range of questionnaires (from 1 to 7, having 4 as medium point), the mean scores were medium–high for relatedness (the mean of mean scores was 5.6), medium for repair (the mean of means scores was 4.6) and small-medium for loneliness (the mean of mean scores was 2.2). The correlations between the items of the same factor were positive and significant, $r$ ranged from .08 to .67, $ps < .05$. All indicators of relatedness and repair correlated positively, and significantly, $r$ ranged from .08 to .27, $ps < .05$. The indicators of loneliness correlated negatively or with values close to zero with the other indicators, $r$ ranged from .00 to −.39. In general, most of these bivariate correlations were significant at .05 level.

### 3.2 Structural Equation Modeling

#### *3.2.1 Measurement Model*

The fit indices for the measurement model were as follows: $\chi^2 = 419.51$, $df = 227$, $p < .01$; CFI = .95, RMSEA = .03 (90 % CI .03–.04), SRMR = .04. Values of the fit indices showed that the measurement model had an adequate fit (see Table 2 for factor loadings, Cronbach's alpha, McDonalds omega coefficients and covariances between latent variables on measure model).

#### *3.2.2 Simple Mediation Model*

The role of relatedness as a mediator between repair and loneliness was examined. The four conditions required by causal steps approach to evaluate this mediation are presented on Table 2. All the conditions were satisfied, except for condition c. That is, the Log-likelihood Chi Square Difference Test was statistically reliable, indicating that relatedness functions as a partial mediator. This is so because the effect between repair and loneliness

**Table 1** Correlations and descriptive statistics for observable variables

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Rel1 | | | | | | | | | | | |
| 2. Rel2 | .45† | | | | | | | | | | |
| 3. Rel3 | .41† | .49† | | | | | | | | | |
| 4. Rel4 | .31† | .40† | .33† | | | | | | | | |
| 5. Rel5 | .48† | .50† | .46† | .32† | | | | | | | |
| 6. Rep1 | .19† | .18† | .24† | .21† | .19† | | | | | | |
| 7. Rep2 | .16† | .15† | .20† | .17† | .21† | .58† | | | | | |
| 8. Rep3 | .11† | .15† | .13† | .12† | .20† | .45† | .59† | | | | |
| 9. Rep4 | .15† | .15† | .18† | .17† | .26† | .50† | .63† | .62† | | | |
| 10. Rep5 | .08* | .10† | .20† | .16† | .21† | .32† | .40† | .31† | .39† | | |
| 11. Rep6 | .20† | .20† | .25† | .15† | .19† | .33† | .37† | .29† | .29† | .35† | |
| 12. Rep7 | .13† | .15† | .15† | .11† | .19† | .35† | .43† | .38† | .38† | .28† | .32† |
| 13. Lon1 | −.18† | −.26† | −.27† | −.17† | −.33† | −.22† | −.17† | −.18† | −.21† | −.16† | −.12† |
| 14. Lon2 | −.17† | −.28† | −.34† | −.21† | −.32† | −.19† | −.16† | −.13† | −.19† | −.15† | −.14† |
| 15. Lon3 | −.20† | −.29† | −.30† | −.19† | −.40† | −.22† | −.18† | −.21† | −.23† | −.10† | −.09* |
| 16. Lon4 | −.24† | −.35† | −.34† | −.20† | −.38† | −.20† | −.23† | .19† | −.23† | −.15† | −.15† |
| 17. Lon5 | −.15† | −.22† | −.26† | −.16† | −.22* | −.11† | −.09* | −.12† | −.13† | −.13† | −.06 |
| 18. Lon6 | −.23† | −.30† | −.33† | −.17† | −.38† | −.18† | −.16† | −.15† | −.19† | −.14† | −.09* |
| 19. Lon7 | −.11* | −.16† | −.18† | −.13† | −.20† | −.12† | −.09* | −.03 | −.08* | −.11† | −.10† |
| 20. Lon8 | −.17† | −.23† | −.30† | −.15† | −.27† | −.14† | −.12† | −.07 | −.09* | −.08* | −.12† |
| 21. Lon9 | −.24† | −.24† | −.33† | −.23† | −.34† | −.23† | −.18† | −.13† | −.18† | −.15† | −.11† |
| 22. Lon10 | −.10† | −.19† | −.09* | −.05 | −.10* | −.07 | −.01 | .05 | .00 | .03 | −.06 |
| 23. Lon11 | −.22† | −.32† | −.33† | −.20† | −.33† | −.14† | −.13† | −.12† | −.16† | −.13† | −.07 |
| Mean | 5.50 | 5.78 | 5.38 | 5.50 | 5.75 | 4.70 | 4.86 | 4.38 | 4.61 | 4.33 | 4.76 |
| SD | 1.15 | 1.05 | 1.20 | 1.42 | 1.21 | 1.54 | 1.49 | 1.61 | 1.59 | 1.58 | 1.46 |

| Variables | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Rel1 | | | | | | | | | | | | |
| 2. Rel2 | | | | | | | | | | | | |
| 3. Rel3 | | | | | | | | | | | | |
| 4. Rel4 | | | | | | | | | | | | |
| 5. Rel5 | | | | | | | | | | | | |
| 6. Rep1 | | | | | | | | | | | | |
| 7. Rep2 | | | | | | | | | | | | |
| 8. Rep3 | | | | | | | | | | | | |
| 9. Rep4 | | | | | | | | | | | | |
| 10. Rep5 | | | | | | | | | | | | |
| 11. Rep6 | | | | | | | | | | | | |
| 12. Rep7 | | | | | | | | | | | | |
| 13. Lon1 | −.11† | | | | | | | | | | | |
| 14. Lon2 | −.17† | .46† | | | | | | | | | | |
| 15. Lon3 | −.11† | .67† | .52† | | | | | | | | | |
| 16. Lon4 | −.19† | .59† | .59† | .68† | | | | | | | | |

**Table 1** continued

| Variables | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17. Lon5 | −.13† | .29† | .34† | .30† | .37† | | | | | | | |
| 18. Lon6 | −.16† | .46† | .41† | .54† | .58† | .30† | | | | | | |
| 19. Lon7 | −.05 | .21† | .25† | .30† | .39† | .24† | .31† | | | | | |
| 20. Lon8 | −.13† | .39† | .39† | .32† | .37† | .39† | .33† | .27† | | | | |
| 21. Lon9 | −.16† | .44† | .44† | .52† | .56† | .32† | .56† | .34† | .34† | | | |
| 22. Lon10 | −.01 | .23† | .17† | .18† | .19† | .11† | .21† | .08* | .23† | .19† | | |
| 23. Lon11 | −.17† | .45† | .44† | .46† | .53† | .40† | .53† | .27† | .48† | .47† | .24† | |
| Mean | 4.58 | 2.22 | 1.82 | 1.65 | 1.61 | 2.66 | 1.59 | 1.89 | 2.92 | 1.62 | 3.13 | 2.34 |
| SD | 1.53 | 1.46 | 1.27 | 1.21 | 1.13 | 1.47 | 1.01 | 1.28 | 1.82 | 1.16 | 1.77 | 1.47 |

* $p < .05$; † $p < .01$

**Table 2** Factor loadings, Cronbach's alpha, McDonalds omega coefficients and covariances between latent variables on measure model

| Item | Factor loading | Cronbach's alpha | McDonalds omega | Latent variable | Covariance | | |
|---|---|---|---|---|---|---|---|
| | | | | | Relatedness | Repair | Loneliness |
| Rel1 | .62† | .79 | .87 | Relatedness | – | – | – |
| Rel2 | .71† | | | | | | |
| Rel3 | .67† | | | | | | |
| Rel4 | .51† | | | | | | |
| Rel5 | .71† | | | | | | |
| Rep1 | .67† | .81 | .83 | Repair | .38† | – | – |
| Rep2 | .82† | | | | | | |
| Rep3 | .73† | | | | | | |
| Rep4 | .78† | | | | | | |
| Rep5 | .49† | | | | | | |
| Rep6 | .46† | | | | | | |
| Rep7 | .53† | | | | | | |
| Lon1 | .70† | .86 | .91 | Loneliness | −.59† | −.33† | – |
| Lon2 | .66† | | | | | | |
| Lon3 | .77† | | | | | | |
| Lon4 | .81† | | | | | | |
| Lon5 | .47† | | | | | | |
| Lon6 | .70† | | | | | | |
| Lon7 | .44† | | | | | | |
| Lon8 | .52† | | | | | | |
| Lon9 | .69† | | | | | | |
| Lon10 | .27† | | | | | | |
| Lon11 | .69† | | | | | | |

Factor loadings and covariances between latent variables are standardized values; † $p < .001$

was transmitted both directly (the A-C path coefficient in the Unconstrained A-B-C model was significant) and indirectly (the indirect effect was significant). The whole model explained the 16 % relatedness and the 36 % loneliness variables.

### *3.2.3 Interaction Model*

The interaction between relatedness and repair was tested. The baseline model consisted of a model where relatedness and repair were predictors of loneliness. The interaction of relatedness and repair was also included as a predictor, but its relation was constrained to zero. In this model, both relatedness and repair had a significant negative relationship with loneliness, $B = -.69$ and $B = -.16$, respectively, $ps < .01$. The interaction model was identical to the baseline model, except that the relation of the interaction was not constrained. In this model, relatedness and repair also had a significant negative relationship with loneliness, $B = -.68$ and $B = -.19$, respectively, $ps < .01$. The relation between the interaction component and loneliness was positive and significant, $B = .25$, $p < .01$. The Log-likelihood Chi square difference test was significant, indicating that the interaction model was significantly better than the baseline model, $\chi^2\ (1) = 2.90$, $p < .05$. All these results indicate that there is an interaction between relatedness and repair.

### *3.2.4 Moderated Mediation Analysis*

The mediating role of relatedness in the relationship between repair and loneliness at different levels on relatedness and repair was examined. Table 3 shows the mediation analysis in groups with low and high relatedness levels, whereas Table 4 shows the mediation analysis in groups with low and high repair levels. Figure 1 represents the path diagram of the unconstrained A-B-C model of the mediation analysis for all groups. These results revealed that the four conditions required for mediation were satisfied in the group with low levels on relatedness and in the group with high levels on repair. It is worth noting that although in the group with low levels of relatedness the CFI values were marginal, the rest of the fit indexes were clearly appropriate. Since condition c was satisfied in these two groups, that is, the difference test was non-significant, the results demonstrate just mediation. In opposition to these results, the mediation analysis in the group with high levels of relatedness and in the group with low levels of repair showed that not all conditions required for mediation were satisfied. The failure to find mediation in the group with high levels of relatedness was caused by the fact that repair was not significantly related to relatedness and, in turn, relatedness was not significantly related to loneliness (see A-B and B-C path coefficients in the A-B-C model in Table 3 and lower path regressions of upper figure in Fig. 1). These results were reflected in a non-significant indirect effect. The same thing can be said about the group with low levels of repair, with the exception that relatedness was significantly related to loneliness (see A-B and B-C path coefficients in the A-B-C model and indirect effect test in Table 4 and upper path regressions of lower figure in Fig. 1) (Table 5).

## 4 Discussion

The objective of the present study was to analyze the mediating role of relatedness between emotional repair and loneliness during adolescence. A simple mediation analysis revealed that the mediational effect was partial, being the directions of the relations as predicted.

**Table 3** Fit indices and path coefficients for the simple mediation model

| Cond. | Model | Fit index | | | | | | | Path coefficient | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\chi^2$ | *df* | RMSEA | 90 % CI | | CFI | SRMR | Relation | β | 95 % CI | |
| | | | | | LL | UL | | | | | LL | UL |
| A | A-C | 286.59† | 134 | .04 | .03 | .05 | .94 | .04 | A-C | −.34* | −.42 | −.25 |
| B | A-B-C | 425.76† | 228 | .04 | .03 | .04 | .95 | .05 | A-B | .40* | .30 | .50 |
| | | | | | | | | | B-C | −.60* | −.68 | −.52 |
| C | Cons. A-B-C | 425.76† | 228 | .04 | .03 | .04 | .95 | .05 | – | – | – | – |
| | Uncons. A-B-C | 419.51† | 227 | .04 | .03 | .04 | .95 | .04 | A-C | −.13† | −.22 | −.04 |
| | Diff. test | 6.64* | 1 | – | – | – | – | – | – | – | – | – |
| D | Indirect effect test | – | – | – | – | – | – | – | – | −.20* | −.28 | −.13 |

Cond. = Casual step condition; *df* = degrees of freedom; RMSEA = Root mean square error of approximation; CFI = Comparative fit index; SRMR = Standardized root mean square residual; CI = Confidence interval; LL = Lower limit; UL = Upper limit; Cons. = Constrained; Uncons. = Unconstrained; Diff. test = Loglikelihood Chi square difference test; A = Independent variable (Repair); B = Mediator (Relatedness); C = Dependent variable (Loneliness); * $p < .05$; † $p < .01$

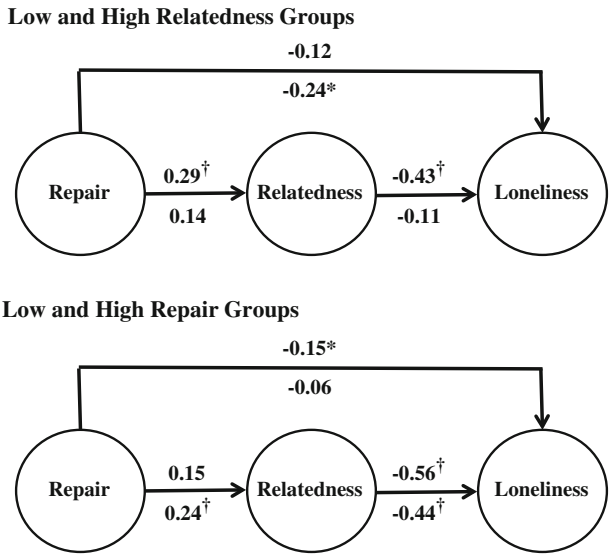


**Fig. 1** Path diagrams of the moderated mediation. *Note*: *Upper figure* path diagram of the unconstrained A-B-C model for low and high relatedness groups. Upper path regressions correspond to low relatedness group, whereas lower path regressions correspond to high relatedness group. *Lower figure* path diagrams of the unconstrained A-B-C model for low and high repair groups. Upper path regressions correspond to low repair group, whereas lower path regressions correspond to high repair group. Path coefficients are standardized values. * $p < .05$; † $p < .01$

Thus, on the one hand, repair was positively associated to relatedness, in line with EI studies (Augusto-Landa et al. 2011; Brackett et al. 2010; Lopes et al. 2011). That is, adolescents with the ability to modify their emotions tended to perceive that their need for social interactions was fulfilled. On the other hand, relatedness was negatively associated to the feeling of loneliness, in agreement with previous findings within SDT motivational theoretical framework (Wei et al. 2005). That is, adolescents whose need for social relationships was highly fulfilled reported low loneliness. The results of a moderated mediation analysis, however, revealed that the relation of both repair and relatedness with loneliness was more complex than initially expected. These results revealed that relatedness played a meditational role under very specific conditions, namely, certain levels of repair and relatedness.

Regarding relatedness, mediation was found when the levels of relatedness were low, but not when they were high. These results suggest that in those adolescents whose need for relatedness is not satisfied, the feeling of loneliness is diminished through relatedness. In this case, adolescents could modify social connectedness perception in two different ways. One way would be by regulating onés own and other‘s emotions with the purpose of improving the quantity and/or the quality of the relationships (e.g., increasing the number of friends and/or establishing closer relationships), which, in turn, could improve social connectedness perception. Another way would be directly improving the satisfaction of social connection. This could be accomplished by increasing the perception of social connectedness (e.g., by thinking “I’m not isolated, it is just that my friends are busy and cannot hang out with me today”), or by reducing the importance of social connectedness (e.g., by thinking “It is not that bad to be alone. When I’m on my own, I can do whatever I

**Table 4** Fit indices and path coefficients for low and high relatedness groups

| Group | Cond. | Model | Fit Index | | | | | | | Path coefficient | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $\chi^2$ | *df* | RMSEA | 90 % CI | | CFI | SRMR | Relation | β | 95 % CI | |
| | | | | | | LL | UL | | | | | LL | UL |
| Low Relatedness | A | A-C | 238.94† | 134 | .06 | .05 | .07 | .90 | .06 | A-C | −.25† | −.38 | −.12 |
| | B | A-B-C | 417.38† | 228 | .05 | .04 | .06 | .89 | .06 | A-B | .34† | .14 | .53 |
| | | | | | | | | | | B-C | −.50† | −.69 | −.31 |
| | C | Cons. A-B-C | 417.38† | 228 | .05 | .04 | .06 | .89 | .06 | – | – | – | – |
| | | Uncons. A-B-C | 415.12† | 227 | .05 | .04 | .06 | .89 | .06 | A-C | −.12 | −.27 | .03 |
| | | Diff. test | 2.23 | 1 | – | – | – | – | – | – | – | – | – |
| | D | Indirect effect test | – | – | – | – | – | – | – | – | −.17* | −.30 | −.04 |
| High Relatedness | A | A-C | 175.47† | 134 | .03 | .02 | .04 | .94 | .06 | A-C | −.25† | −.42 | −.08 |
| | B | A-B-C | 318.81† | 228 | .03 | .03 | .04 | .90 | .07 | A-B | .22 | −.08 | .52 |
| | | | | | | | | | | B-C | −.22 | −.54 | .10 |
| | C | Cons. A-B-C | 318.81† | 228 | .03 | .03 | .04 | .90 | .07 | – | – | – | – |
| | | Uncons. A-B-C | 310.78† | 227 | .03 | .02 | .04 | .91 | .06 | A-C | −.24* | −.42 | −.05 |
| | | Diff. test | 7.93† | 1 | – | – | – | – | – | – | – | – | – |
| | D | Indirect effect test | – | – | – | – | – | – | – | – | −.05 | −.22 | .12 |

Cond. = Casual step condition; *df* = degrees of freedom; RMSEA = Root mean square error of approximation; CFI = Comparative fit index; SRMR = Standardized root mean square residual; CI = Confidence interval; LL = Lower limit; UL = Upper limit; Cons. = Constrained; Uncons. = Unconstrained; Diff. test = Loglikelihood Chi square difference test; A = Independent variable (Repair); B = Mediator (Relatedness); C = Dependent variable (Loneliness); * $p < .05$; † $p < .01$

**Table 5** Fit indices and path coefficients for low and high repair groups

| Group | Cond. | Model | Fit Index | | | | | | | Path coefficient | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $\chi^2$ | *df* | RMSEA | 90 % CI | | CFI | SRMR | Relation | β | 95 % CI | |
| | | | | | | LL | UL | | | | | LL | UL |
| Low Repair | A | A-C | 243.43† | 134 | 0.05 | 0.04 | 0.06 | 0.91 | 0.05 | A-C | −0.23† | −.39 | −.07 |
| | B | A-B-C | 385.01† | 228 | 0.05 | 0.04 | 0.05 | 0.91 | 0.06 | A-B | 0.18 | −.04 | .39 |
| | | | | | | | | | | B-C | −0.59† | −.70 | −.47 |
| | C | Cons. A-B-C | 385.01† | 228 | 0.05 | 0.04 | 0.05 | 0.91 | 0.06 | – | – | – | – |
| | | Uncons. A-B-C | 381.59† | 227 | 0.05 | 0.04 | 0.05 | 0.91 | 0.06 | A-C | −0.15* | −.29 | −.01 |
| | | Diff. test | 0.00 | 1 | – | – | – | – | – | – | – | – | – |
| | D | Indirect effect test | – | – | – | – | – | – | – | – | −0.10 | −0.24 | 0.03 |
| High Repair | A | A-C | 193.88† | 134 | 0.04 | 0.02 | 0.05 | 0.91 | 0.05 | A-C | −0.16* | −.31 | −.01 |
| | B | A-B-C | 314.79† | 228 | 0.03 | 0.02 | 0.04 | 0.91 | 0.05 | A-B | 0.25† | .07 | .42 |
| | | | | | | | | | | B-C | −0.46† | −.59 | −.33 |
| | C | Cons. A-B-C | 314.79† | 228 | 0.03 | 0.02 | 0.04 | 0.91 | 0.05 | – | – | – | – |
| | | Uncons. A-B-C | 314.22† | 227 | 0.03 | 0.02 | 0.04 | 0.91 | 0.05 | A-C | −0.06 | −.21 | .10 |
| | | Diff. test | 0.48 | 1 | – | – | – | – | – | – | – | – | – |
| | D | Indirect effect test | – | – | – | – | – | – | – | – | −0.11* | −0.21 | −0.02 |

*Cond.* Casual step condition, *df* degrees of freedom, *RMSEA* root mean square error of approximation, *CFI* comparative fit index, *SRMR* standardized root mean square residual, *CI* confidence interval, *LL* lower limit, *UL* upper limit, *Cons.* constrained, *Uncons.* unconstrained, *Diff. test* loglikelihood Chi square difference test, *A* Independent variable (Repair); *B* Mediator (Relatedness), *C* Dependent variable (Loneliness); * $p < .05$; † $p < .01$

want whenever I want"). Unfortunately, our work does not provide enough information to determine which of these strategies adolescents employ. Therefore, further research should try to shed light on this question.

When relatedness was high, relatedness did not play any meditational role. Instead, emotional repair directly influenced loneliness, pointing out the possibility that the ability to modify emotions was used to change directly the feeling of loneliness (Zysberg 2012). In this case, the adolescents perceiving social connectedness with their peers might use their emotional repair abilities to alter their feelings of loneliness whenever they occurred. For example, when they feel lonely, they can try to change the bad feeling by thinking pleasant things.

As for emotional repair, mediation was only found under certain circumstances: when the levels of repair were high. When they were low, repair was directly associated to loneliness. This pattern of results could indicate that those adolescents that regulate the feeling of loneliness through relatedness require higher use of emotional regulation than those who directly regulate the feeling of loneliness.

This is the first study that integrates motivational and emotional variables, traditionally studied separately, to predict feelings of loneliness during adolescents. The resulting model suggests that adolescents deal with loneliness in different ways depending on their emotion regulation abilities and perceived relatedness. Our data suggest that those adolescents with low relatedness and/or high emotional repair seem to manage their feelings of loneliness through the alteration of the perceived connectedness with their peers. Adolescents with high relatedness and/or low emotional repair, however, apparently reduce their feelings of loneliness directly altering this unpleasant feeling.

The integration of motivational and emotional theories into a single model in our study implied assuming specific structural relations and directions between the variables. Specifically, EI theories state that loneliness is a consequence of poor emotional repair abilities (Chapman and Hayslip 2005; Thompson et al. 2007); and SDT informs that loneliness is a consequence of poor relatedness (Wei et al. 2005). Even though the fit of the models found in our study were good, it cannot be discarded that the true directionality between the variables could be the other way around. This model with the directionality reversed is an equivalent model. That is, it is a model whose overall fit is identical to the tested model and, consequently, it is not possible to distinguish between both models (reversed and non-reversed models) statistically. This limitation is related to the use of cross-sectional data, since data involving variables measured at the same time make difficult to determinate the causal directionality. Future research should address this problematic by carrying out longitudinal studies.

In line with this, it is well worth noting that the use of cross-sectional data in our data poses a statistical limitation, since it is known that cross-sectional studies are not the most preferable type of data to analyze mediation. Cross-sectional tests of mediation may yield statistical bias, whose magnitude may be large. Thus, cross-sectional tests may find evidence of mediation when mediation does not exist, or do not find evidence for mediation when mediation exists (Maxwell and Cole 2007; Maxwell et al. 2011). Longitudinal mediation analyses may avoid this statistical bias. For this reason, it would be interesting to undertake a similar study with longitudinal data to verify our findings.

Assuming relatedness as an antecedent and loneliness as a consequence has important conceptual implications. The cognitive discrepancy model of loneliness (Peplau and Perlman 1982) defines loneliness as a discrepancy between the current and the desired levels of interpersonal relations. Within SDT (Deci and Ryan 2000), relatedness is the degree in which the desire to feel connected with, and mutually supportive of significant

others is satisfied. The similarity between both concepts is quite obvious, which may lead to the argument that loneliness and relatedness refer to the same phenomenon. One of the strengths of our data is that they shed light on this controversy (Heinrich and Gullone 2006). We found that relatedness and loneliness were not always associated. Concretely, this association was not found in those adolescents with high levels of relatedness. This supports the notion that, despite the fact that they may overlap, relatedness and loneliness are different phenomena. Further research is needed to explore in more depth the nature and scope of each concept so as to come up with a more parsimonious account of loneliness.

It is important to recognize that this study is exploratory. However, the confirmation of our results in future studies would have practical implications for the development of new prevention and treatment programs for loneliness in adolescents that could be applied at school. For those adolescents that manage loneliness directly through the feeling of loneliness, training programs on emotional intelligence would be appropriate for them. In contrast, for those adolescents that modify the feeling of loneliness indirectly through increasing the satisfaction with their social relationship a different approach would be needed. In this case, programs should try to promote peers and student–teacher relationships by generating close, positive and supporting classroom environments.

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