The Influence of Social Self-Efficacy on Loneliness Mediated by the Interpretation Bias

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Bachelor's thesis

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June 20, 2022

Abstract

Loneliness in adolescence is common in youth and predictive of many negative socioemotional outcomes, such as depression and anxiety. Previous research has shown that loneliness is negatively related to social self-efficacy. This study set out to elaborate on the already established relationship of loneliness and social self-efficacy. Based on social-cognitive theory, it was hypothesised that the relationship between social self-efficacy and loneliness is mediated by the tendency to make positive and negative interpretations. Participants were 1201 adolescents from secondary schools in the Netherlands who filled out questionnaires for all relevant variables. A regression analysis showed that adolescents with high social self-efficacy were more likely to make positive and less likely to make negative interpretations, and subsequently they were less likely to experience loneliness. Furthermore, there were significant indirect effects of social self-efficacy on loneliness via the positive and negative interpretation bias: the interpretation bias could explain the relationship between social self-efficacy and loneliness. However, the mediating effect of the negative interpretation bias was larger than that of the positive interpretation bias, which suggests that the effects of positive and negative interpretations in the relationship between loneliness and social self-efficacy differ. Even after controlling for the mediators, however, social self-efficacy has a direct effect on loneliness. In other words, people with high social self-efficacy are less likely to experience loneliness, and this effect is explained in part by the interpretations that one makes. Future interventions can address loneliness through social self-efficacy and the interpretation bias.

The influence of social self-efficacy on loneliness mediated by the interpretation bias

Adolescents experience high rates of loneliness: about a quarter of adolescents report being lonely (Victor & Yang, 2012). Loneliness is defined as the subjective dissatisfaction over the perceived discrepancy between one's desired and one's actual relationships (Peplau & Perlman, 1982). Most people will experience loneliness at some point in their lives (Holt-Lunstad et al., 2015), but it is by far the most prevalent for young adults and old adults (Victor & Yang, 2012). The high prevalence of loneliness in adolescence is explained with the developmental task of peer connection. During adolescence, parental relationships become less important, while peer relationships increase in importance (Sullivan, 1953). This shift from parental to peer relationships is associated with a temporary increase in loneliness, while adolescents figure out how to achieve peer friendships (Steinberg & Morris, 2001). The loneliness resulting from unmet social needs is distressing, and it is often accompanied by feelings of frustration, sadness, and anxiety (Heinrich & Gullone, 2006). Moreover, loneliness can have many negative outcomes; for example, it is related to depression (Beutel et al., 2017; Schinka et al., 2013), anxiety, suicidal ideation (Beutel et al., 2017), stress, and low self-esteem (Vanhalst et al., 2013), but it can also affect physical health, as evident by the higher rates of cardiovascular disease and cerebrovascular disease (Friedler et al., 2015). Given this range of outcomes related to loneliness, it is vital to understand loneliness to be able to prevent loneliness and the associated negative outcomes.

There is a large body of research dedicated to understanding loneliness (e.g., Bayat et al., 2021; Beutel et al., 2017; Holt-Lunstad et al., 2015; Newall et al., 2009; Schwartz-Mette et al., 2020), and one of the factors that loneliness has been related to is social self-efficacy (Tu & Zhang, 2015; Watson & Nesdale, 2012; Wei et al., 2005). Social self-efficacy is an individual's confidence in their ability to engage in social interactional tasks that are necessary to initiate and maintain relationships (Smith & Betz, 2000). Lonely individuals

have a lower social self-efficacy (Tu & Zhang, 2015): they view themselves as inferior (Akdogan, 2017) and perceive their social skills more negatively than others would rate them (Cacioppo & Hawkley, 2009). While they perceive their social skills to be worse, social skills in themselves are not related to loneliness (Schinka et al., 2013), but it is rather the perception of one's social skills, i.e. one's social self-efficacy, that predicts loneliness (Tu & Zhang, 2015; Watson & Nesdale, 2012; Wei et al., 2005). The relationship between social self-efficacy and loneliness is explained by social-cognitive theory, a predominant theory on self-efficacy (Bandura, 1977). According to social-cognitive theory, cognitive beliefs shape human actions (Bandura, 1977). An example of a cognitive belief can be the belief that one can master challenges of the environment or exercise control over the environment. Those beliefs affect how people feel and act. So, if someone experiences loneliness but believes that they can reconnect with others, they will act in accordance with their beliefs and attempt to reconnect with others. On the other hand, if someone experiences loneliness but does not believe that they have the capacity to initiate relationships (i.e. low social self-efficacy), they will act in accordance with that belief and not establish new relationships; hence, they will remain lonely. This is how loneliness and social self-efficacy are related.

Loneliness and social self-efficacy have been related to the interpretation bias in separate studies (e.g., Cacioppo & Cacioppo, 2018; Newall et al., 2009; Shintel et al., 2006; Spithoven et al., 2017). Previous research that has included the interpretation bias in relation to loneliness or social self-efficacy has mainly been interested in the negative interpretation bias. The negative interpretation bias is defined as the negative or catastrophised interpretation of ambiguous social events (Chen et al., 2020). Research has provided evidence for the positive relationship between loneliness and the negative interpretation bias as well as for the negative relationship between social self-efficacy and the negative interpretation bias (Cacioppo et al., 2014; Cacioppo et al., 2006; Cacioppo & Hawkley, 2009; Newall et al.,

2009; Shintel et al., 2006). In particular, low social self-efficacious individuals would interpret social events as threatening and hold more negative social expectations (Cacioppo & Hawkley, 2009). They anticipate rejection in social interactions (Spithoven et al., 2017), and such negative expectations lead to negative interpretations of social situations (Voncken et al., 2003). Subsequent behavioural confirmation of the negative interpretations results in loneliness (Cacioppo & Cacioppo, 2018; Cacioppo & Hawkley, 2009). Thus, the negative interpretation bias might explain the relationship between social self-efficacy and loneliness. In line with that reasoning, Beard et al. (2019) and Müller-Pinzler et al. (2019) found that social self-efficacy is negatively related to the negative interpretation bias, and Qualter et al. (2013) found that the negative interpretation bias is associated with higher levels of loneliness. So, while previous research has not investigated the mediation of loneliness and social self-efficacy by the negative interpretation bias specifically, based on Beard et al. (2019), Müller-Pinzler et al. (2019), and Qualter et al. (2013) it is plausible that the negative interpretation bias explains the relationship between social self-efficacy and loneliness.

This potential mediation would also be supported by social-cognitive theory. As mentioned before, social-cognitive theory says that one's beliefs of self-efficacy influence one's expectations of social situations. Those who have low beliefs of social self-efficacy will have negative expectations of social situations (Thomas & Bowker, 2015; Watson & Nesdale, 2012). In turn, those expectations affect how one thinks, acts, feels, and even perceives the world (Bandura, 1977). If one has negative expectations of social situations, they will interpret social situations negatively, according to social-cognitive theory. People with low self-efficacy would therefore be more likely to make negative interpretations of social situations (Beard et al., 2019): those negative interpretations confirm one's low social self-efficacy beliefs (Voncken et al., 2003). Finally, those negative interpretations will be confirmed through one's behaviour: people will act in less socially desirable ways, which

makes maintaining social relationships difficult, and one will become lonely (Cacioppo et al., 2014). So, low social self-efficacy would make one tend to use negative interpretations, which results in higher levels of loneliness.

Whereas there is an abundance of literature regarding the negative interpretation bias, the tendency for positive interpretations[1] is mentioned rarely. Yet, social cognitive-theory would also suggest a mediation of social self-efficacy and loneliness by the positive interpretation bias (Bandura, 1977). Those who have high levels of social self-efficacy would have positive expectations of social interactions and make positive interpretations of those interactions, and these positive interpretations would result in lower levels of loneliness. Testing this relationship would address a gap in the research: literature often focuses on the negative interpretation bias and has not investigated positive interpretations as a protective mechanism. Three articles have found that positive interpretations are negatively related to a correlate of loneliness, namely anxiety (Chan et al., 2020; Krebs et al., 2018; Miers et al., 2008), but all other studies that studied the interpretation bias have only focused on negative interpretations (for a review, see Spithoven et al., 2017). Following social-cognitive theory, the positive interpretation bias could be related to social self-efficacy and loneliness, just as the negative interpretation might be (Bandura, 1977). Hence, it is expected that the positive interpretation bias mediates the relationship between social self-efficacy and loneliness.

In summary, the current article will investigate the question: To what extent do the positive and negative interpretation bias mediate the relationship between social self-efficacy and loneliness? Such a research question would shed light on the mechanisms of loneliness. Previous research has only focused on the negative interpretation bias, but by including both

[1] In academic literature, it is common practice to reserve the term "interpretation bias" for negative interpretations only (Miers et al., 2008). This reflects researchers' interest in negative over positive interpretation tendencies. Still, for the purposes of simplicity, it was chosen to use the term "positive interpretation bias" to describe the tendency for positive interpretations in this article, and to use the term "negative interpretation bias" to describe a tendency for negative interpretations. "Interpretation bias" in this article refers to a pattern of valence in interpretations, regardless of whether this pattern is positive or negative.

the positive and the negative interpretation bias, a possible maintaining and buffering mechanism can be investigated. Additionally, the mediation of the relationship between social self-efficacy and loneliness is a unique contribution of this study to the academic literature; to date, no study has investigated a potential mediation between these variables. Studying this potential mediation could generate a greater understanding about the effect of social self-efficacy and the factors that are involved in loneliness: rather than only establishing the relationship between social self-efficacy and loneliness, as has been done in previous literature, this study provides a process model of the relationship between these variables. Considering the many negative consequences of loneliness (see Beutel et al., 2017; Friedler et al., 2015; Schinka et al., 2013; Vanhalst et al., 2013), it is important to understand the processes involved in loneliness to address the phenomenon effectively in interventions and prevent the negative outcomes associated with loneliness. Previous research has already established that targeting cognitive processes in loneliness interventions is effective (Käll et al., 2020; Masi et al., 2011), and if the relationship between social self-efficacy and loneliness is mediated by the interpretation bias, the specific process involving social self-efficacy and the interpretation bias could be targeted by loneliness interventions. Furthermore, by including both the positive and negative interpretation bias, this study takes a more holistic approach to interpretations than other studies, which have only investigated the negative interpretation bias.

The corresponding hypotheses of this research question are:

1. Social self-efficacy is related to loneliness, as stated by Wei et al. (2005), Watson and Nesdale (2012) and Tu & Zhang (2015). Those who are low in social self-efficacy will have lower levels of loneliness.

2. Social self-efficacy is related to the negative interpretation bias, as stated by Cacioppo and Hawkley (2009) and Spithoven et al. (2017). Those with low social self-efficacy are more likely to make negative interpretations.
3. Social self-efficacy is related to the positive interpretation bias, as follows from social-cognitive theory (Bandura, 1977) and Cacioppo and Hawkley (2009). Those with low social self-efficacy are less likely to make positive interpretations.
4. The negative interpretation bias is positively related to loneliness, as shown by Cacioppo et al. (2014) and Newall et al. (2009). Those who have a negative interpretation bias will experience higher levels of loneliness, while those without such a bias will have low levels of loneliness.
5. The positive interpretation bias is negatively related to loneliness, as would follow from social-cognitive theory (Bandura, 1977). Those who have a positive interpretation bias will experience lower levels of loneliness.
6. The relationship between social self-efficacy and loneliness is mediated by the negative interpretation bias, as would follow from hypotheses 2 and 4 and social-cognitive theory (Bandura, 1977). The negative interpretation bias partially explains the relationship between social self-efficacy and loneliness.
7. The relationship between social self-efficacy and loneliness is mediated by the positive interpretation bias, as would follow from hypotheses 3 and 5 and social-cognitive theory (Bandura, 1977).

These hypotheses will be tested in a correlational study that has measured social self-efficacy, the positive interpretation bias, the negative interpretation bias, and loneliness in a sample of Dutch adolescents. A mediation analysis will be conducted in which social self-efficacy is the independent variable, the positive and negative interpretation bias the mediators, and loneliness the dependent variable.

Methods

Participants

Participants were secondary school students in the Netherlands. After the participants with missing data and outliers were removed, a total of 1201 participants were included in the study. For the study to have sufficient statistical power (.8) with an alpha of .05 and an effect size of .12 (effect size based on Watson & Nesdale, 2012), 84 participants were needed. The age range of the participants was 10-14 with a mean age of 12.8. 50.5% of participants were male, 49.5% were female.

Measures

Loneliness

The Louvian Loneliness scale for Children and Adolescents (LEKA) was used to measure loneliness in the sample (Goossens, 2016). The questionnaire was developed for Dutch-speaking children and adolescents and consists of four sub-scales, of which only the scale of loneliness in peer relationships was used in this research, given that peer loneliness is the main source of loneliness in adolescents (Steinberg & Morris, 2001). Sample statements of the peer-loneliness scale are “I think I have fewer friends than others” and “I feel alone at school.” The scale consisted of twelve questions in total with four answer options: “*Never*” coded as 1, “*Rarely*” (2), “*Sometimes*” (3), and “*Often*” (4). The answers were summed to provide a final score of loneliness, providing a range from 12-48, with low scores representing low levels of loneliness, and high scores representing high levels of loneliness. The reliability coefficient of LEKA in this study was $\alpha = .89$.

Social Self-Efficacy

A sub-scale of the Self-Efficacy Questionnaire for children (SEQ-C) was used to assess this variable, namely the subscale measuring social self-efficacy (Muris, 2001). This sub-scale included eight questions, such as "*How well can you become friends with other children?*" and "*How well can you have a chat with an unfamiliar person?*" The answer options were on a 5-point Likert scale ranging from "*very bad*" (1) to "*very good*" (5). The answers were summed, providing a range of 8-40. Higher scores on the scale convert to higher levels of social self-efficacy. The reliability coefficient of the social self-efficacy subscale of SEQ-C was $\alpha = .77$.

Interpretation Bias

To measure the interpretation bias of participants, the social situations subscale of the Adolescent Interpretation and Belief Questionnaire (AIBQ) was used (Miers et al., 2008). This scale posed participants with a scenario, such as "*You've invited a group of classmates to a birthday party, but a few have not yet said if they're coming. Why haven't they said something yet?*" This scenario was followed by three possible interpretations, a positive, neutral, and negative one. For each interpretation, participants indicated the likelihood that this interpretation would occur to them on a 5-point Likert scale (1= "*does not pop up in my mind*", 3= "*might pop up in my mind*", and 5= "*definitely pops up in my mind*"). There were a total of five scenarios, each with three potential interpretations. All responses to the negative interpretations were averaged to create the scale for the negative interpretation bias; the responses to the positive interpretations were averaged to create the scale for the positive interpretation bias. The range of scores for the scales is 1-5, a higher score indicating that the interpretation was more likely to come to mind. The reliability coefficient of the negative interpretation bias scale was $\alpha = .65$; Cronbach's alpha for the positive interpretation bias scale was $\alpha = .57$. These coefficients, while not ideal, are rated as "sufficient" (Yu et al.,

2021) and are similar to the reliability coefficients reported in other articles (Gibb et al., 2022; Miers et al., 2013; Yu et al., 2019; Yu et al., 2021).

Procedure

Data was taken from the longitudinal study Pubers in Beeld, of which only the data from the first time wave was used for the current research. Ethical approval from the Institutional Review Board of the Radboud University Nijmegen was obtained prior to data collection (ECG2012-2711-701). Six secondary schools in the Netherlands agreed to participate in the study. Parents of students at those schools were sent an information letter and consented to their child's participation or not. Adolescents who participated in the study also provided informed consent. Completion of the questionnaires occurred during school hours and on computers under the supervision of trained undergraduate students. In exchange for their participation, participants received a small gift, such as a pencil.

Statistical Analysis

SPSS version 26 was used for all analyses. The first step of the analysis was to clear the data. Participants who did not complete the questionnaires, of which there were 17, were removed from the sample, as well as five participants who were identified as outliers by Mahalanobis's distance. Reliability coefficients for each of the measures were computed, after which the total scores for each of the variables were created.

Then, the assumptions for the analysis were checked. The normality of the data was checked by checking the skewness and kurtosis values, but these values were outside of the normal range of -1 to 1 for both the loneliness variable and the residuals (for loneliness, skewness = 1.51 and kurtosis = 2.28, and for the residuals, skewness = .909 and kurtosis = 1.76). This was accounted for by applying bootstrapping in the final analysis. A linearity test

showed that the linearity assumption was not violated, $F(19) = 0.907$, $p = .574$ for the analysis with positive interpretation bias and $F(19) = 1.474$, $p = .086$ for the analysis with the negative interpretation bias. The multicollinearity assumption was not violated either. The VIF for social self-efficacy was 1.24; the VIF for the positive interpretation bias was 1.14; and the VIF for the negative interpretation bias was 1.14; which were all far below the criterion of 3. The homoscedasticity assumption was tested with the Breusch-Pagan test, $R^2 = .358$, $F(3, 1997) = 58.80$, $p < .001$. This means that the assumption of homoscedasticity was violated, which was accounted for in the final analysis with Huber-White's heteroscedasticity-consistent interference.

Then, descriptive statistics of the sample were collected, as well as descriptive statistics for each variable. After, correlations between the variables were computed. Finally, the mediation model was tested using the extension PROCESS in SPSS, in which loneliness was the dependent variable, social self-efficacy the independent variable, and the negative interpretation bias and the positive interpretation bias were the mediators. This model was tested by combining the results of four submodels: in the first two models, the relationship between the independent variable social self-efficacy and the mediator (either negative or positive interpretation bias) was tested; in the second model, the effect of social self-efficacy and the mediators on loneliness were tested; and in the third model, the total effect of social self-efficacy on loneliness was tested. Finally, the indirect effects of social self-efficacy on loneliness via the mediators were tested. The alpha level for all analyses was $\alpha = .05$.

Results

Means and standard deviations were calculated for social self-efficacy, the positive and negative interpretation bias, and loneliness, as well as correlations between these variables. The descriptive statistics are presented in Table 1, the correlations in Table 2. Most participants had low levels of loneliness. Loneliness correlated negatively with social self-efficacy and the positive interpretation bias, and positively with the negative interpretation bias. Social self-efficacy was positively related to the positive interpretation bias and negatively to the negative interpretation bias. These correlations were all significant and in the expected directions.

Table 1

Means, Standard Deviations, and Minimum and Maximum Scores of Social Self-Efficacy, Interpretation Biases, and Loneliness

Variables	M	SD	Minimum score	Maximum score
1. Loneliness	17.7	5.7	12	43
2. Social self-efficacy	30.3	4.3	15	40
3. Negative interpretation bias	2.6	0.7	1	5
4. Positive interpretation bias	3.0	0.7	1	5

Table 2

Correlations of Social Self-Efficacy, Interpretation Biases, and Loneliness

Variables	1.	2.	3.
1. Loneliness			
2. Social self-efficacy	-.53*		
3. Negative interpretation bias	.43*	-.33*	
4. Positive interpretation bias	-.24*	.34*	-.19*

Note. * $p < .001$.

In the analysis that is described below, loneliness was the dependent variable, social self-efficacy the independent variable, and the negative interpretation bias and the positive interpretation bias were entered as the mediators.

The first model of this mediation model tested path a_1 (see Figure 1), meaning that social self-efficacy was the independent and the negative interpretation bias the dependent variable, $R^2 = .12$, $F(1, 1199) = 162.81$, $p < .001$. This means that 12% of the variance in the negative interpretation bias could be explained by social self-efficacy. The effect of social self-efficacy on the negative interpretation bias was significant and negative, $\beta = -.34$, $t(1199) = -12.76$, $p < .001$. This means that for every decrease in social self-efficacy, people experienced an increase in the negative interpretation bias and were more likely to interpret social events negatively.

The second model predicted path a_2, so it predicted the positive interpretation bias with social self-efficacy, $R^2 = .12$, $F(1, 1199) = 124.62$, $p < .001$. 12% of the variance in the positive interpretation bias could be explained by social self-efficacy. Social self-efficacy had a significantly positive effect on the positive interpretation bias, $\beta = .34$, $t(1199) = 11.16$, $p < .001$. This means that for every decrease in social self-efficacy, people experienced a

decrease in the positive interpretation bias and were less likely to interpret social events positively.

The third model took loneliness as the dependent variable and social self-efficacy, the negative interpretation bias, and the positive interpretation bias as predictors. In other words, it estimated the coefficients for path b_1, b_2, and c' (see Figure 1). This model was significant too, $R^2 = .35$, $F(3, 1197) = 157.49$, $p < .001$, which means that the predictors collectively explained 35% of the variance in loneliness. Social self-efficacy was a significant and negative predictor of loneliness, $\beta = -.41$, $t(1199) = -14.12$, $p < .001$. This means that if social self-efficacy increases, loneliness decreases. It has thus a direct effect on loneliness. The negative interpretation bias was a significant positive predictor of loneliness too, $\beta = .29$, $t(1199) = 10.93$, $p < .001$. This means that those who were interpreting situations negatively had higher rates of loneliness. Lastly, the positive interpretation bias also significantly predicted loneliness, $\beta = -.05$, $t(1199) = -2.15$, $p = .0494$. In other words, people who had a tendency for positive interpretations were less lonely, although this effect was small.

The total effect of the mediation model (path c) was significant too, $R^2 = .27$, $F(1, 1199) = 338.62$, $p < .001$. In this model, which did not include any control variables, social self-efficacy explained 27% of the variance in loneliness. Social self-efficacy was a significant and negative predictor of loneliness, $\beta = -.52$, $t(1199) = -18.40$, $p < .001$.

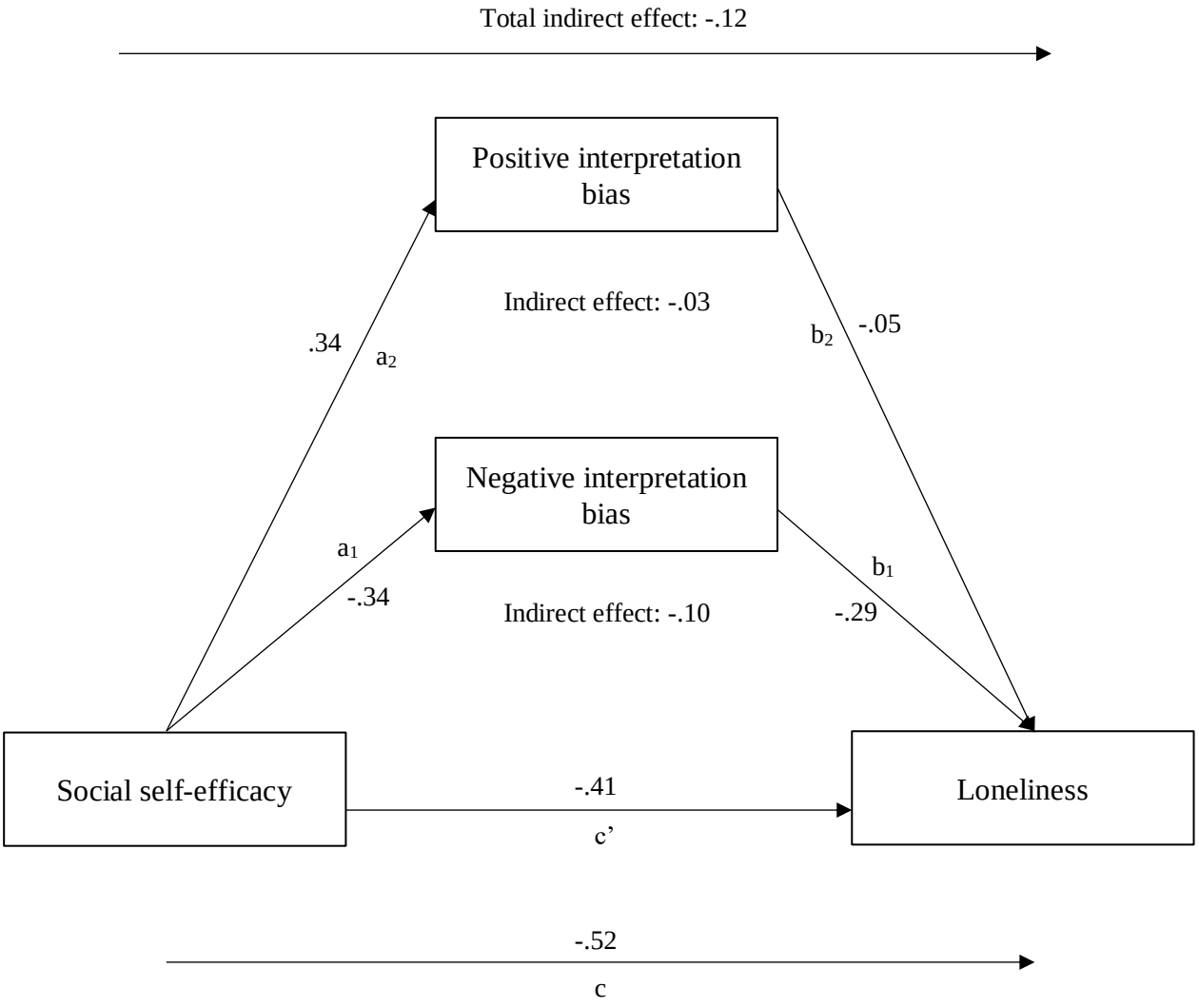
The indirect effect of social self-efficacy on loneliness via the negative interpretation bias was significant, $\beta = -.10$, 95% CI [-.12, -.08]. This means that the negative interpretation bias partially explained the relationship between social self-efficacy and loneliness. The positive interpretation bias mediated the relationship between social self-efficacy and loneliness too, $\beta = -.02$, 95% CI [-.03, -.01]. It can therefore partially explain the relationship between social self-efficacy and loneliness. The total indirect effect of these two mediators

was β = -.12, 95% CI [-.14, -.09]. Hence, it can be said that the relationship between social self-efficacy and loneliness are explained partially by the interpretations that one makes.

These effects are summarised in Figure 1.

Figure 1.

Mediation Model with Standardized Coefficients



Note. All coefficients are standardized coefficients and are significant at $p < .05$.

Discussion

The aim of this study was to answer the question: To what extent do the positive and negative interpretation bias mediate the relationship between social self-efficacy and loneliness? The data provided evidence for the negative relationship between social self-efficacy and loneliness. In addition, social self-efficacy influenced the positive and negative interpretation bias to the same degree: higher social self-efficacy was associated with more positive and less negative interpretations. In turn, people who made negative interpretations had higher scores of loneliness, in line with the fourth hypothesis. Simultaneously, those who made positive interpretations had lower levels of loneliness, as was predicted by hypothesis 5. Furthermore, it was expected that the relationship between loneliness and social self-efficacy would be partially mediated by both the negative interpretation bias and the positive interpretation bias. Indeed, it was found that the negative and positive interpretation bias explained the relationship between social self-efficacy and loneliness. The indirect effect via the negative interpretation bias was larger than the indirect effect via the positive interpretation bias, though. Besides the mediation effects, there was still a significant direct effect of social self-efficacy on loneliness.

The relationship between social self-efficacy and loneliness is well-established in the literature. The relation between these variables that was found by Wei et al. (2005) and Watson & Nesdale (2012) is replicated in this study, and the effect in this study is of similar size as those reported by Wei et al. (2005) and Watson & Nesdale (2012). This finding is consistent with social-cognitive theory, which posits that one's confidence in their ability to initiate and maintain relationships is expressed in their behaviour, which then becomes a self-fulfilling prophecy: people that are confident in their social skills can regulate their relationships effectively, while those who are insecure will have poor social relationships and can develop loneliness (Bandura, 1977). Furthermore, even after controlling for the

mediators, social self-efficacy continues to influence loneliness. So, while this relationship occurs partially through the interpretation bias, as was shown in this study, the interpretation bias is not all there is to this process. Social self-efficacy is also directly expressed in behaviour, and these behaviours lead to relationship outcomes such as loneliness (Akdogan, 2017). Therefore, those who have low self-efficacy are more likely to experience loneliness.

The current study integrated the interpretation bias into the research on social self-efficacy and loneliness. Firstly, it was found that social self-efficacy is related positively to the positive interpretation bias and negatively to the negative interpretation bias. These relationships are of equal size. With these findings, this study adds to the scarce literature relating interpretation biases to social self-efficacy. Previously, self-efficacy beliefs have been related to the negative interpretation bias (Beard et al., 2019), but to the knowledge of the author, there has not been any evidence for the relationship between social self-efficacy and the positive interpretation bias. The relationship between social self-efficacy and the positive interpretation bias is in line with social-cognitive theory though, which argues that one's interpretation bias will confirm one's social self-efficacy beliefs (Bandura, 1977). The theory does not differentiate between the valence of those beliefs. In other words, people with high social self-efficacy will be more likely to make positive interpretations, because those are in accordance with their self-efficacy beliefs, while people with low social self-efficacy are more likely to make negative interpretations. This is indeed what was found.

Regarding the relationship between the interpretation biases and loneliness, both interpretation biases were significantly associated with loneliness, but the negative interpretation bias was related more strongly to loneliness than the positive interpretation bias was. The relationship between loneliness and the negative interpretation bias that was found in this study replicates the finding of Qualter et al. (2013), who found that the negative interpretation bias is positively associated with loneliness: those who make negative

interpretations are more likely to experience loneliness. There has been no previous research on the relationship between the positive interpretation bias and loneliness, which was found to be negative in this study. Given the tendency of researchers to focus on negative rather than positive interpretations (Miers et al., 2008), it is difficult to establish whether the difference in effect size of the interpretation biases is consistent with other literature. To the knowledge of the author, only the study by Lau et al. (2021) included and compared different valences of interpretation in relation to loneliness. Their findings are similar to this study: negative interpretations are related to loneliness to a larger extent than positive interpretations are. This suggests that the relationship of the negative and positive interpretation bias to loneliness are not the same, which warrants further study into the positive interpretation bias and comparisons of the negative and positive interpretation bias.

Furthermore, it was hypothesised that the negative interpretation bias and the positive interpretation bias mediated the relationship between social self-efficacy and loneliness. Below, the mediation model will be discussed separately for the negative and positive interpretation bias.

Concerning the mediation by the negative interpretation bias, it was indeed found that the negative interpretation bias partially explains the relationship between social self-efficacy and loneliness. This is consistent with previous findings in academic literature, which has evidenced the two paths separately. It has already been established that people with low social self-efficacy have negative expectations of social situations (Spithoven et al., 2017) and expect rejection in social situations (Watson & Nesdale, 2012). Subsequently, they have negative interpretations of social situations (Voncken et al., 2003). Simultaneously, when people expect rejection and interpret social situations negatively, they are more likely to engage in behaviours that confirm these cognitions (Cacioppo & Cacioppo, 2018; Cacioppo & Hawkley, 2009); they will withdraw from social situations, for example (Watson &

Nesdale, 2012). In other words, the negative interpretation bias confirms one's low social self-efficacy, and behavioural responses such as social withdrawal occur to confirm these negative interpretations too. In turn, behavioural and cognitive confirmation of negative social cognitions result in loneliness (Cacioppo & Hawkley, 2009), but this process has also been found to predict other psychosocial outcomes such as major depressive disorder (Van Winkel et al., 2017). So, while previous literature and theory has shown the individual relationships between social self-efficacy and the negative interpretation bias, and the negative interpretation bias and loneliness, this study adds to that literature by finding evidence for a mediating relationship of the negative interpretation bias on social self-efficacy and loneliness.

As for the mediation of the relationship between social self-efficacy and loneliness by the positive interpretation bias, significant findings were reported as well: the positive interpretation bias mediates the relationship between loneliness and social self-efficacy. However, the mediating effect of the positive interpretation bias is much smaller than the mediating effect of the negative interpretation bias; it was close to zero. In other words, positive interpretations affect loneliness to a lesser extent than negative interpretations. It seems that while negative interpretations contribute to loneliness, positive interpretations influence loneliness less strongly. This finding can be put into the context of the reaffiliation motive hypothesis. The reaffiliation motive argues that one's interpretation of social situations causes one to either reinforce their feelings of loneliness or recover from loneliness (Qualter et al., 2015). People that attend too much to negative stimuli and give mostly negative interpretations to social situations will reinforce their loneliness (Qualter et al., 2015). On the other hand, the people that manage to resolve their loneliness do not solely make positive interpretations; instead, they focus on both positive and negative stimuli, which helps them to adjust their behaviour to the situation more appropriately and capitalise on

positive incentives and minimise negative ones (Nikitin & Freund, 2008). In other words, according to the reaffiliation motive hypothesis, the negative interpretation bias is related to an increase in loneliness, as the results of this study showed, but a decrease in loneliness is related to the combination of positive and negative interpretations. Positive interpretations would need to be balanced with negative interpretations to result in lower levels of loneliness. This thesis did not compare negative interpretations to positive-and-negative interpretations, hence it cannot test this hypothesis, but it is an interesting conjecture for future research.

A strength of this research is its sample: the size was large enough to yield good statistical power. The sample was obtained using random clustered sampling of schools, and all students at these schools were approached to participate. The random nature of this sampling method is conducive to the representativeness of the sample. Additionally, the sample is similar to the Dutch adolescent population in its demographic characteristics (Centraal Bureau voor Statistiek [CBS], 2019), which makes this sample more representative of the larger Dutch adolescent population.

Some limitations of the current study need to be addressed. Firstly, while the reliability coefficients that were found for the positive and negative interpretation bias are consistent with those find in other papers (see Gibb et al., 2022; Miers et al., 2013; Yu et al., 2019; Yu et al., 2021), the low reliability of the questionnaire assessing the positive and negative interpretation bias reduces the confidence in the results. Secondly, only the dimension of peer loneliness was used in this study. Given the fact that loneliness is inherently social, the social context in which loneliness is studied is of marked importance (Peplau & Perlman, 1982). People might apply different strategies in different contexts to recover from loneliness, or social self-efficacy might differ by the social context that one is in, thus studying peer loneliness and general social self-efficacy might not convey the nuances of the relationship between other dimensions of these variables.

Future research can account for these limitations in the following ways. Firstly, different measures of the interpretation bias could be used, such as the Adolescent Interpretation Bias Task (Lau et al., 2020). It is a self-report measure that includes positive and negative interpretations and has a subscale for social situations. As such, it is similar to the measure that was used in this study, but it has been shown to have a higher reliability (see Lau et al., 2020; Lau et al., 2021). Secondly, future research could look at other dimensions of loneliness. The current study only looked at peer loneliness, but experiences of loneliness differ by the social context in which it occurs. One example of another dimension of loneliness is parental loneliness, which refers to the loneliness experienced in parental relationships (Goossens, 2016). Parental loneliness is related less strongly to social self-efficacy (Cheng et al., 2021), and its relationship to the interpretation bias might deviate from the relationship between the interpretation bias and peer loneliness that was outlined in this study. Therefore, parent loneliness might need to be addressed through other factors than social self-efficacy.

Generally, future research could investigate the positive interpretation bias to get a clearer picture of the role of the positive interpretation bias in socioemotional problems. For example, research has consistently found an association between the negative interpretation bias and depression and anxiety (for reviews, see Chen et al., 2020; Everaert et al., 2017), but it might be interesting to see how the positive interpretation bias is related to these constructs. Additionally, based on the current study, it seems that making positive interpretations is not a uniform solution to loneliness, and instead, those who are not experiencing loneliness likely have found a healthy balance between positive and negative interpretations, as follows from the reaffiliation motive hypothesis (Qualter et al., 2015). These people know when to make positive and when to make negative interpretations. Future research could investigate this

hypothesis and clarify the situations in which it is advantageous to make positive interpretations, and in which situations negative interpretations are more appropriate.

Conclusion

This study set out to provide a more detailed understanding of the relationship between social self-efficacy and loneliness. Based on social-cognitive theory, it was hypothesised that the negative and positive interpretation bias mediated the relationship between social self-efficacy and loneliness. The effect of the negative and positive interpretation bias, albeit both significant, did not have the same magnitude, though: the negative interpretation bias was a small-to-medium mediator of the relationship, but the positive interpretation bias had a significant but marginal mediating effect on the relationship. It therefore seems that the magnitude of the effect of positive and negative interpretations differ. Future research could investigate the unique role of positive versus negative interpretations in socioemotional problems such as depression and anxiety.

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