Does Secure Base Activation Buffer Against Loneliness?

The Moderating Role of Prosocial Behaviour

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Abstract

Loneliness has many adverse effects that can decrease the quality of life if left untreated. Recently, an increase in loneliness has been registered caused by the COVID-19 pandemic, indicating a great need for interventions that counter loneliness. This study examines a previously found buffering effect of secure (vs insecure) base activation on loneliness. The current research is aimed to replicate these findings and extend them by exploring prosocial behaviour as a potential moderator. For this experimental study, participants ($N = 401$) were recruited through an online survey (including measures of prosocial behaviour and loneliness). Participants were randomly assigned to either secure or insecure base activation conditions. Results indicate a positive replication of the previously found effect: secure (vs insecure) base activation reduced loneliness. A moderated regression analysis found a non-significant moderation effect indicating that prosocial behaviour does not affect the relationship between a secure (vs insecure) base condition. This leads one to conclude that although prosocial behaviour and a secure base activation, each by themselves, have decreased loneliness compared to an insecure base activation, there is no interaction between these two, which would cause a more significant decrease in loneliness.

Keywords: secure base, insecure base, loneliness, attachment theory, prosocial behaviour, prosocialness

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The Moderating Role of Prosocial Behaviour

In recent times, loneliness has become an often and important topic of scientific study (Fardghassemi & Joffe, 2022). The COVID-19 pandemic has made us aware that we are more prone to suffer from loneliness than any of us could have imagined. Lives have been threatened, and many have been lost by an illness known little about in the past. Due to strict lockdown regulations and restrictions placed on social contact by the government aiming to reduce the strain on hospitals, there has been an unprecedented increase in loneliness and a decrease in life satisfaction throughout the pandemic (Benke et al., 2023; Takács et al., 2023). From a crisis that doctors in hospitals have managed, we now have moved to an evident mental health deterioration, as a study by Benke and colleagues (2023) suggests.

Loneliness

Russel and colleagues (1984) have described loneliness as "an aversive experience, similar to other negative affective states such as depression or anxiety." Shortcomings, or deficiencies, as Russel et al. (1984) described loneliness, "may be quantitative (e.g., not enough friends) or they may be qualitative (e.g., lack of intimacy with others)" (Russell et al., 1984, p. 1313). This might indicate that there are different kinds of loneliness. For this study, however, loneliness will be looked at as one, measured by the UCLA loneliness scale (Appendix D). A variety of subjective conditions can cause loneliness. Fardghassemi and Joffe (2022) studied loneliness in the UK and found that loneliness is clustering around five themes. These are the "feeling of being disconnected, contemporary culture, pressure, social comparison and transitions between life stages" (Fardghassemi & Joffe, 2022, p. 1). Causes for loneliness included in these themes are lack of face-to-face communication, the feeling that one does not matter, pressure to fit in, feelings of lagging behind one's peers, breakups,

and loss…; the list is long. Furthermore, Fardghassemi and Joffe (2022) have discovered that social media increases these feelings.

Loneliness is a condition that increases adverse effects on physical and mental health (Pai & Vella, 2022). Consequently, it should be studied more, so that interventions can be found and that we reduce the many adverse and significant effects. Indeed, loneliness has been shown to have effects, such as depressed moods, anxiety (Santini & Koyanagi, 2021), sleep problems (Matthews et al., 2017) and even higher mortality rates (Patterson, 2010). These conditions threaten health and well-being, as indicated by the increase in mortality rates. As loneliness is the common denominator in this, the opportunity to tackle all these hurdles on the road to a healthy life with a single intervention presents itself. This raises questions concerning what needs to be done to effectively counter loneliness and what individuals can do to not feel lonely in the first place—previous studies by Kroker et al. (2022) and Piepers (2022) have explored the reduction of loneliness using a secure (vs insecure) base activation which are essential notions in attachment theory.

Attachment Theory and Secure Base

A **secure base** is a notion that stems from research on attachment theory (Ainsworth & Bowlby, 1991; Bowlby, 1969/1982, 1988) and is described as a place from which "a child or an adolescent can [depart from] into the outside world and to which [they] can return knowing for sure that [they] will be welcomed [back], nourished physically and emotionally, comforted if distressed, reassured if frightened." (Bowlby, 1988, p. 11). By contrast, an insecure base is anything that endangers this secure base by introducing factors (e.g., a pandemic) or removing factors (e.g., passing of an attachment figure), thereby hindering/taking away this sense of safety. A secure base can involve anyone ranging from a parent, in the view of the early attachment theory, to a friend or partner. When one finds themselves in a situation of distress, such as injuring oneself (child turns to parent for

consolation) or a lockdown situation (adults turn to their partner, parent, or friend), a secure base eases these feelings by providing a general feeling of safety (Bowlby, 1988). A secure base in attachment theory (Bowlby, 1969/1982; Mikulincer et al., 2009) is of great importance in an individual's development and coping strategies. Previous research conducted by Kroker et al. (2022) has explored whether secure base *activation* reduces loneliness and found that secure (vs insecure) base activation decreases loneliness (Kroker et al., 2022). Since loneliness presents many adverse effects that reduce overall health and well-being, the focus should be on finding interventions to reduce loneliness, such as activating a secure base. Indeed, since an internalised secure base depends on the environment one finds themselves in and is difficult to change; secure base *activation* may be a simple yet effective way for individuals to actively reduce their loneliness. Thus, our first hypothesis is that secure base activation decreases feelings of loneliness. Piepers (2022) replicated these findings by detecting a significant difference between individuals in the secure base condition compared to the insecure base condition. However, it was unclear whether loneliness was decreased in one condition or increased in the other and should be subject to further research. A study by Mikulincer and colleagues (2009) has provided insight into how a secure base is processed in the mind. They have found that individuals who possess a secure base process information in a script-like manner and are thereby effective in “processing attachment-relevant information” (Mikulincer et al., 2009, p. 630).

This thesis, however, will aim to test whether secure base activation reduces loneliness compared to an insecure base activation (replication). A study conducted by Lanser and Eisenberger (2022) found that “the prosocial behaviour manipulations reduced loneliness” (Lanser & Eisenberger, 2022, p. 8). This leaves the question of whether this moderates the earlier mentioned findings and possibly even decreases loneliness further and could be used as a starting point for an intervention.

Prosocial Behaviour

Prosocial behaviour is most often conducted in an environment where individuals are present, that by Bowlby's attachment theory (1969/1982) can be classified as attachment figures (i.e., family, significant other, friends, individuals who provide social support). Such were utilised by Lanser & Eisenberger (2022) in their experiments. For example, in the first study by Lanser and Eisenberger (2022), participants had to decide which of their social contacts to give a voucher for $10. This was compared to a gift-keeping and a control condition. It was found that individuals in the gift-giving group could significantly reduce their loneliness levels compared as pre-post measures. In the second study of this research, people were instructed to write a "thank you" note of at least 100 words to a person of their choice who provides/provided social support aimed at them. Both actions were classified as prosocial behaviour. They found that engaging in prosocial behaviour, specifically gift-giving, writing a "thank you" note and reflecting on a situation when a significant other provided support, significantly reduced loneliness (Lanser & Eisenberger, 2022). Gift-keeping (receiving), on the other hand, did not indicate significant differences. Considering this research, it can be assumed that engaging in prosocial behaviour positively affects loneliness and provides another possible way of reducing it.

Given these findings, I hypothesise that those who score higher on prosocial behaviour further decrease feelings of loneliness in combination with a secure base activation. This would imply that individuals scoring low on prosocial behaviour and are in the insecure base activation will have significantly higher levels of loneliness than those who are in the secure base activation condition and report higher levels of prosocial behaviour. I imagine that people who are more self-assured because of a secure base will engage in more prosocial behaviour simply because they have "more freedom" to do so. This freedom comes from knowing they have a safe space to return to in case of any troubles compared to

individuals who do not have a secure base. It would seem that these people would not engage in any "risky" behaviour that would expose them to situations that were not anticipated beforehand. Now that the most critical variables and theory have been introduced, it is time to explain what will happen in this study and its aim.

The Current Study and Hypotheses

The study will focus on testing the effect of a secure base activation on loneliness to possibly replicate findings by Kroker and colleagues (2022) and Piepers (2022). Measures of prosocial behaviour will be gathered before participants of the experimental study are divided randomly into two conditions, namely the *secure base activation condition* and the *insecure base activation condition*. Afterwards, measures of loneliness will be collected. The idea is to examine how a condition activation (secure vs insecure) affects loneliness. The hypothesis is that a secure base activation reduces loneliness compared to an insecure base activation. The second hypothesis that will be tested is that prosocial behaviour further decreases the experienced loneliness, moderating a secure base activation condition's relationship with loneliness. This is meant to examine whether the effect found by Lanser and Eisenberger (2022) has any impact on the effect of the findings by Kroker and colleagues (2022) and Piepers (2022). Since the greater aim is to discover a possible intervention for loneliness, it is important also to examine the interaction of these effects that individually seem promising for the aspired goal and whether they can be used in a combined intervention or if they should not be used together because one might inhibit the other.

Method

Participants and Design

The previous studies by Kroker et al. (2022) used sample sizes of 289 and 295. However, since introducing new moderating factors[1], we wanted to boost statistical power

[1] Discussed in separate papers by collaborators

while being mindful of budget restrictions. We decided to therefore increase the targeted number of participants to 400. Using the crowdsourcing data collection service Prolific Academic, we obtained 420 UK participants, from which 401 usable cases remained. The questionnaire was created in Qualtrics and was only available in English. The criteria were set such that participants had to be at least 18 years but should not be older than 60 years. In addition, participants had to be able to understand English fluently to take part. Participation was voluntary and preceded by informed consent ensuring the anonymity and safety of the participants. Furthermore, participation was compensated with one-pound-fifty (£1.5) that the participants received through Prolific Academic.

To ensure attentive completion of the questionnaire, attention checks were incorporated. If participants did not pass those checks, they were excluded from the sample and replaced with a new participant by Prolific Academic. The benefits of using Prolific Academic were obtaining a large number of participants time-efficiently and having access to a large pool of people which ensures some diversity in the sample. From the initial sample of 420 overall, 19 had to be removed because these participants did not have a valid Prolific ID, did not complete the questionnaire, or did not give consent. The final sample comprised 401 participants (44.1% male, 54.1% female; 1% non-binary; 0.7% preferred not to say) with ages ranging from 18 years to 38 with a mean age of 25.4 years. Participants were randomly assigned to either the experimental design's secure or insecure base activation condition.

Procedure

In this study, participants filled out a 20-minute online survey. Before the start, informed consent was acquired. Participants were compensated for their time with one-pound-fifty (£1,50) per 15 minutes. The questionnaire first asked about basic demographics. After measuring the potential moderator, participants were randomly assigned to one of two experimental conditions: a secure base activation condition in which participants were asked

to think about someone who was there for them during a recent emotionally difficult period, or an insecure base activation condition in which participants were asked to think about a person who was *not* there for them during a recent emotionally difficult period. After this manipulation, participants had to answer a loneliness questionnaire. A debriefing was presented at the end of the survey, offering help to cope with loneliness. The researchers were not involved in data collection.

Manipulation and Measures

Moderator: Prosocial behaviour. Caprara and colleagues Field (2005) prosocialness scale for adults (PSA) was used in shortened form to measure prosocial behaviour. The full scale consists of 16 items, such as "I try to console those who are sad" and "I am empathetic with those who are in need", that are scored on a five-point Likert scale with answers from never/almost never true to always/almost always true. For this study, it was decided only to incorporate six items (items 3, 5, 7, 10, 12, 13; see Appendix C for the entire PSA) with high reliability (α = .906). In an Item Response Theory (IRT) analysis conducted on the full scale by Caprara and colleagues (2005), these items have been shown to have the greatest distinction rate between people with high and low prosocialness. Classical Test Theory (CTT) statistics confirmed these findings. A systematic review by Martí-Vilar and colleagues (2019) showed that the PSA is among the prosocialness measures with the highest reliability scores. An exploratory principal component analysis (PCA) concluded that the shortened PSA scale offers a one-factor solution with 68.976% of variance explained. The participants were split at the median (*Mdn* = 4.0) into a high and low prosocialness group for ease of interpretation of whether prosocial behaviour reduces loneliness. For the moderation analysis, however, a continuous approach was utilised.

Manipulation and manipulation check. For this experiment, participants were asked to imagine themselves in one of two randomly assigned conditions, namely the secure base

activation condition and the insecure base activation condition. Each condition provided the participant with a short description of a circumstance that participants were asked to remember. For the secure base activation, participants were asked to reflect on a recent emotionally difficult time when a specific person was there for them. The manipulation included the question: “How did you feel, knowing that this person was someone you could rely on and that would stand by you?” The insecure base activation condition differed only in asking participants to think about a specific person in their life that is important to them but was *not* there in time of need. Participants in both conditions were then asked to describe who and what situation they were thinking of briefly and how this made them feel.

To determine whether the manipulation had been effective, participants were then asked to what extent a person they thought of was there for them and provide the answer on a five-point Likert scale (1 = *never*, 2 = *seldom*, 3 = *about half the time*, 4 = *usually*, 5 = *always*). An independent samples *t*-test was conducted to compare the means of this manipulation check and the manipulation condition they were randomly assigned to.

Outcome Variable: Loneliness. The full UCLA loneliness scale by Russel and colleagues Field (1984) measures the dependent variable loneliness. It was previously used by Kroker et al. (2022) and in the study on prosocial behaviour’s effect on loneliness (Lanser & Eisenberger, 2022). The scale includes 20 items, such as "I am unhappy doing so many things alone" or "I feel as if nobody really understands me", and its goal is to measure participants' level of subjective loneliness. Unlike the original scale, our study uses a five-point Likert scale, in which participants were asked to indicate to what degree they agree or disagree with the 20 statements. A principal component and reliability analysis was conducted to examine the UCLA scale. The latter resulted in high reliability (α = .961), showing that the scales’ items have a great internal consistency. The PCA for loneliness with an Oblimin rotation with Kaiser normalisation indicated that the scale consists of two factors,

presumably emotional and social loneliness. A factor analysis by McWhirter (1990) showed that the UCLA loneliness scale consists of three factors: intimate others, social others and affiliative environment. It was decided not to split the scale by their factor but keep it one since we wanted to measure loneliness as a whole instead of specific types.

General Statistical Procedure

The obtained data was checked on quality by examining the manipulation and attention checks. After, a reliability and factor analysis (principal component analysis with Oblimin rotation) were conducted. The former examines internal consistency, and the latter determines whether the different items of a scale measure the same factors. Before running the analysis to determine the effect of the manipulation conditions on loneliness, it needed to be examined whether the manipulation even worked as intended. An independent samples *t*-test is conducted to check whether a significant difference exists between the two conditions.

To be able to answer the first hypothesis, an independent samples *t*-test is run on the effect of the secure base (insecure base) activation on loneliness (MLone). Lastly, the second hypothesis, that prosocial behaviour (MProSo) further decreases the experienced loneliness in combination with a secure base activation condition needs to be answered. For this, the PROCESS macro by Hayes is run in SPSS with the continuous DV MLone (mean loneliness), the categorical IV Mani (manipulation condition) and the continuous moderator MProSo (mean prosocial behaviour). In addition, an independent samples *t*-test will be conducted to examine whether prosocial behaviour causes significant differences in loneliness. For this, the participants will be split at the median ($Mdn = 4.0$) into a high and low prosocial behaviour group (ModSplit).

Table 1

Descriptive statistics

	Manipulation condition	N	M	SD	Std. Error Mean
Mani-check	Secure base	199	4.52	.797	.056
	Secure base threat	202	3.16	1.244	.088
MLone	Secure base	199	2.2015	.84439	.05986
	Secure base threat	202	2.3906	.89681	.06310
MProSo	Secure base	199	3.9899	.74227	.05262
	Secure base threat	202	3.8985	.79019	.05560

Note. Mani-check refers to the manipulation check, MLone to the mean of all loneliness items and MProSo to the mean of the prosocial behaviour items.

Results

Manipulation Check

Before testing the hypotheses, it had to be examined whether the manipulation worked as intended producing a difference in means for the two manipulation conditions. For this, an independent samples *t*-test (see Appendix A, table 2) was conducted, which concluded that there is a significant difference between the two manipulation groups (t= 13.099, p= <.001, d = 1.046). Inspection of the means showed that in the secure base activation condition (M = 4.52, SD = .797), the mean was higher than in the insecure base activation condition (M = 3.16, SD = 1.24), as seen in Table 1. Thus, the manipulation worked as intended.

Hypothesis Testing

To test the first hypothesis, we conducted a similar *t*-test. This test analysed loneliness and the conditions (secure vs insecure). Another t-test analysed these and prosocialness. The manipulation significantly affected loneliness (t = -2.173, p = .030, d = .871). The effect on

prosocial behaviour proved to be non-significant (t = .492, p = .233, d = .767) (see Appendix A, table 3). This means that the previous findings from Kroker et al. (2022) have been successfully replicated.

To test the second hypothesis, I examined whether there is a moderation effect through prosocial behaviour. A moderation analysis has been conducted using the PROCESS macro. The model summary was significant (F =*7.205,* p = .0001), but the interaction term was not statistically significant (b =*-.1063, se = .1120,* p = .3431). The results indicate no significant moderation by prosocial behaviour on the effect of the secure (vs insecure) base condition on loneliness. When conducting an independent samples t-test on the effect of prosocial behaviour on loneliness, participants were split by the median (Mdn = 4.0) into high/low prosocial behaviour groups, and a significant effect was found (t = 3.503, p < .001, d = .863). This indicates that individuals who engage in more prosocial behaviour report lower loneliness (M = 2.126, SD = .948) compared to individuals engaging in less (M = 2.436, SD = .787), which can be seen in Appendix A, Tables 5 and 6. This aligns with Lanser and Eisenberger's (2022) findings. Finally, Pearson correlation coefficients were calculated for the linear relationship between all variables (Appendix A, table 4). For MLone and MProSo, a negative correlation was found, r (399) = -.200, p <.001. For MLone and Mani, a positive correlation was found, r (399) = .108, p = .30. A positive correlation was found for ModSplit and MProSo, r (399) =.768, p <.001, and a negative correlation for ModSplit and MLone, r (399) = -.176, p <.001.

Discussion

The results of the present study support the primary hypothesis that secure (vs insecure) base activation reduces loneliness. Indeed, the mean loneliness of participants in the secure base activation condition was significantly lower than individuals in the insecure base activation condition. This research aligns with previous findings on loneliness by Kroker and

colleagues (2022) and Piepers (2022). It has been discovered that a secure base can be initiated either contextually or by an external source. The study's findings did not support the second hypothesis, as it was found that prosocial behaviour did not moderate the manipulation effect on loneliness. This is surprising as prosocial behaviour has a positive effect, reducing loneliness (Lanser & Eisenberger, 2022) and thereby would offer a potential interactive reduction of loneliness.

Nevertheless, the secure base manipulation can reduce loneliness irrespective of whether it is higher or lower prosocialness. When looking at correlations between all variables, to explore why the effects do not seem to add up, one can find that the mean loneliness negatively correlates to the mean of prosocial behaviour. This indicates that prosocial behaviour reduces loneliness. One possible explanation is that some individuals need a secure base more than others. It was found that this does not necessarily affect individuals who display less prosocial behaviour compared to individuals who display more, but that both, individuals who engage in more or less prosocial behaviour, seem more likely to score lower on loneliness. Generally, the present research suggests that loneliness can be countered and that negative risks such as depressed mood, anxiety, sleep problems and increased mortality rates (Matthews et al., 2017; Patterson, 2010; Santini & Koyanagi, 2021) can be reduced, thereby contributing to on a long-term healthier life. Specifically, individuals who suffer from existential isolation could benefit from a secure base activation that can lower their loneliness levels (Hoogendoorn, 2023). This, however, is not subject of the paper at hand but is worth mentioning since it stems from the same line of research[2]. Further moderators can be found in Appendix B.

[2] Exploring moderation for the effect of a secure base on loneliness

Theoretical and Practical Implications

The following will focus on the theoretical implications of this research on loneliness, attachment theory and prosocial behaviour. Afterwards, the practical implications of this research will be discussed. Implications this research holds on *loneliness* and interventions emphasise the importance of a secure base. A systematic review of loneliness interventions for university students has shown that interventions that "foster social connectedness and are conducted in a group setting" (Ellard et al., 2022, p. 8) are most successful. These help students to create a secure base for themselves. To enable this further, academic stress should be reduced to increase the likelihood of people joining social groups (McIntyre et al., 2018). When looking at the five themes that Fardghassemi and Joffe introduced (2022), "feeling[s] of being disconnected, contemporary culture, pressure, social comparison and transitions between life stages" (Fardghassemi & Joffe, 2022, p. 1), one could argue that these factors significantly affect young university students that are still finding their footing. An umbrella review by Veronese and colleagues (2020) showed that three interventions out of seven showed to be significant, namely meditation/mindfulness, social cognitive training, and social support. Another meta-analysis by Masi and colleagues (2011) has found four primary intervention strategies: improving social skills, enhancing social support, increasing opportunities for social contact, and addressing maladaptive social cognitions. When revisiting the notion of a secure base, one can see how it connects to many of these existing interventions and strategies by default. Increasing social skills, for example, enables better social support and possibly eases the development of a secure base.

The implication this research holds on *attachment theory is* that a secure base can be contextually activated without having an internalised secure base as proposed by Bowlby and Ainsworth (Ainsworth & Bowlby, 1991; Bowlby, 1969/1982, 1988). This might indicate that a secure base benefits anyone, but instead of being developed and internalised, it can prevent

certain risk factors by activation. Simply thinking back to a memory in which a secure base was present and using this in future situations where one does not necessarily have a secure base. Secure base priming, also attachment security priming, precisely explores this notion. A systematic review by Gillath and Karantzas (2019) confirms: “What is clear from this systematic review is that studies published in the last two years suggest that priming attachment security yields positive effects across a diverse set of outcomes and that this line of inquiry is very much worth pursuing” (Gillath & Karantzas, 2019, p. 94). It was found that security priming in the form of guided imagery and visualisation is associated with positive effects (Gillath & Karantzas, 2019).

Prosocial behaviour does not moderate the found effect on loneliness. However, in previous studies, it has been suggested that it by itself leads to a significant decrease in loneliness levels (Lanser & Eisenberger, 2022). These findings were replicated. In addition, prosocial behaviour might still benefit this relationship by positively affecting the development of an internalised secure base rather than moderating the effect. Regularly engaging in prosocial behaviour with the same individual(s) could develop a dynamic in which the person receiving the behaviour becomes an attachment figure. This could be verbalised or otherwise shown to the person engaging in prosocial behaviour, creating a secure base for this individual.

This study’s results invite to introduce secure base activation interventions in populations that suffer from high levels of loneliness. Loneliness is omnipresent in all stages of life. Children, students, adults, and the elderly are all affected by loneliness in one way or another. A secure base activation intervention could be introduced for each stage in life, whether in primary school, high school, university, a workplace or even a home for the elderly. Each offers different opportunities to aid individuals in reducing loneliness and educate them on practical tools they can access in the future should they ever become lonely.

As previously mentioned, security priming is already being utilised but is not yet well known in the general population and even less so put into practice on a broad scale; however, it is being extensively researched (Rowe et al., 2020). Engaging in prosocial behaviour reduces loneliness by itself. It offers an easy opportunity to reduce one's loneliness levels, in addition to being helpful to society. Interventions that make use of prosocial behaviour could be applied in school and university settings using a lecture on this topic. Such an intervention looks promising as it is cost-effective and can be applied simultaneously to large groups of people. In reducing loneliness levels, adverse effects on physical and mental health can be reduced, and risks can be avoided. This creates a path to a healthier and more fulfilling life.

Limitations and Directions for Future Research

The present study comes with multiple limitations. The most prominent one is that with only the current research, it is impossible to state whether a secure base decreases loneliness levels or an insecure base increases loneliness. Previous research suggests that even both might be the case (Kroker et al., 2022). The current research could only determine a significant difference between secure and insecure base activation. To be able to make statements offering insights into the matter, a control group would need to be re-introduced, as done previously by Kroker and colleagues (2022), with an increased sample size.

Another limitation of this experiment was the manipulation itself. Individuals were instructed to describe the situation they were asked to think of as per the manipulation conditions. It became evident that a large number of participants needed to provide a description of their thoughts or write more. This could suggest that some participants did not seriously engage with the manipulation conditions and did subsequently not experience a secure (insecure) base activation. Participants in future research could be instructed to write at least ten sentences to engage with their experiences more in-depth to activate a secure base condition better.

In future research, it would be interesting to examine three aspects: cultural context, gender difference and the effect on the different loneliness dimensions. Research on loneliness in a cultural context by Heu and colleagues (2021) has shown that depending on the kind of social relationship norms, more restrictive norms "protect from the risk of physical isolation" (Heu et al., 2021, p. 69), but increase the risk for emotional and perceived isolation. Depending on this, it would be interesting to know if a secure base activation's effectiveness differs for different cultures (individualistic vs collectivistic), and if so, for which it is more/less effective in decreasing loneliness levels. Gender differences could lead to insight into better-suited interventions tailored more to the individual. Since loneliness itself has been shown to consist of multiple dimensions during factor analyses (McWhirter, 1990), an exciting topic of research could also be to distinguish which dimensions can be specifically targeted by interventions with means of a secure base activation and which ones with an intervention based on prosocial behaviour.

Conclusion

In conclusion, the research question of whether secure base activation buffers against loneliness can be answered with yes. Secure base activation does buffer against loneliness compared to insecure base activation. People who engage in more prosocial behaviour do not additionally reduce their loneliness in combination with a secure base activation, as hypothesised. However, in itself, prosocial behaviour is effective in reliably reducing loneliness (Lanser & Eisenberger, 2022). Therefore, it should be considered for possible interventions against loneliness. Since this experimental study included six possible moderators next to the secure (vs insecure) base activation's effect on loneliness, and the experiment targeted all moderators, a future study with a more focused approach may come to a different conclusion.

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Appendix A[3]

Table 2

Independent Samples Test (Manipulation check)

		Levene's Test		t-test for Equality of Means						
									95% CI of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	LL	UL
Mani-check	Equal variances assumed	72.029	.000	13.058	399	.000	1.364	.104	1.159	1.570
	Equal variances not assumed			13.099	342.892	.000	1.364	.104	1.159	1.569

Note. Manicheck = manipulation check. This t-test shows the questionnaire manipulation check compared to the assigned conditions.

Table 3

Independent Samples Test (Conditions – MLone [main effect], Conditions - MProSo)

		Levene's Test		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	LL	UL
MLone	Equal variances assumed	.710	.400	-2.173	399	.030	-.18909	.08701	-.36015	-.01803
	Equal variances not assumed			-2.174	398.187	.030	-.18909	.08697	-.36007	-.01810
MProSo	Equal variances assumed	.473	.492	1.194	399	.233	.09143	.07658	-.05913	.24199
	Equal variances not assumed			1.194	398.102	.233	.09143	.07655	-.05906	.24193

Table 5

Descriptive statistics

	ModSplit	N	Mean	Std. Deviation	Std. Error Mean
MLone	Low	221	2.4355	.78693	.05293
	High	180	2.1264	.94750	.07062

[3] Order of table numbers altered for a better fit

Table 4

Correlations

		ModSplit	MProSo	MANI	MLone
ModSplit	Pearson Correlation	1	.768**	-.097	-.176**
	Sig. (2-tailed)		.000	.052	.000
	N	401	401	401	401
MProSo	Pearson Correlation	.768**	1	-.060	-.200**
	Sig. (2-tailed)	.000		.233	.000
	N	401	401	401	401
MANI	Pearson Correlation	-.097	-.060	1	.108*
	Sig. (2-tailed)	.052	.233		.030
	N	401	401	401	401
MLone	Pearson Correlation	-.176**	-.200**	.108*	1
	Sig. (2-tailed)	.000	.000	.030	
	N	401	401	401	401

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 6

Independent Samples Test (MLone – ModSplit)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MLone	Equal variances assumed	8.037	.005	3.569	399	.000	.30913	.08661	.13886	.47941
	Equal variances not assumed			3.503	347.412	.001	.30913	.08826	.13554	.48272

Appendix B

Further moderators:

Attachment style. To measure the attachment style of participants, a shortened version of the Experiences in Close Relationships Scale by Brennan and colleagues (1998) was used. It includes 20 items, such as "I want to get close to my partner, but I keep pulling back", measuring avoidant attachment, or "My desire to be very close sometimes scares people away", measuring anxious attachment. A 7-point Likert scale marks down answers from "Strongly disagree" to "Strongly agree" (Brennan et al., 1998).

Extraversion. The BFI is a self-report measure that assesses the five dimensions of personality based on the five trait taxonomy by OP John. It includes five subscales, each measuring one personality trait. The sole subscale of interest in the present study is the extraversion subscale. It assesses an individual's level of extraversion, which refers to sociability and seeking gratification from social situations. It includes eight items and is scored on a 5-point scale (from "*strongly disagree*" = 1 to "*strongly agree*" = 5). This measure offers good psychometric properties and reliability with a Cronbach's alpha of 0.76 (Reyes Zamorano et al., 2014).

Interpersonal trust. Five out of the six items of the general trust scale were used to measure interpersonal trust. This test consists of statements like "Most people are basically honest" or "Most people are trustful of others" and a five-point Likert scale for participants to answer to what extent they agree with those statements. One item was deleted, as it was expected not to load with answers to the other statements (Yamagishi & Yamagishi, 1994).

Existential isolation. To measure Existential Isolation, the 6-item Existential Isolation Scale was used (Pinel et al., 2017). For each item, participants had to indicate their agreement with the statement from point 1 (strongly disagree) to point 7 (strongly agree). Examples of the statements are "People do not often share my perspective" and "People around me tend to

react to things in our environment the same way I do." The latter is an example of a reverse-coded item. The scale is considered to have reasonable internal reliability ($\alpha = 0.84$) (Pinel et al., 2017).

Avoidant coping. The subscale of avoidant coping from the brief COPE measures avoidant coping. This scale consists of twenty-eight questions, but since only the avoidant coping subscale is relevant, only this subscale is used, and it consists of eight questions. With each statement, people can indicate to what extent they apply to the statement. The four-point scale goes from 1, 'I have not been doing this at all' to 4, 'I have been doing this a lot'. The mean of the scale is 1.64, which will be used to categorise participants into groups of 'people who score low on avoidant coping' and 'people who score high on avoidant coping'. Cronbach's Alpha was found to be 0.72 (Carver, 1997).

Appendix C

Table 7

Prosocialness Scale for Adults (PSA) (Caprara et al., 2005)

Statements	Rating
1. I am pleased to help my friends/colleagues in their activities	1 2 3 4 5
2. I share the things that I have with my friends	1 2 3 4 5
3. I try to help others	**1 2 3 4 5**
4. I am available for volunteer activities to help those who are in need	1 2 3 4 5
5. I am empathic with those who are in need	**1 2 3 4 5**
6. I help immediately those who are in need	1 2 3 4 5
7. I do what I can to help others avoid getting into trouble	**1 2 3 4 5**
8. I intensely feel what others feel	1 2 3 4 5
9. I am willing to make my knowledge and abilities available to others	1 2 3 4 5
10. I try to console those who are sad	**1 2 3 4 5**
11. I easily lend money or other things	1 2 3 4 5
12. I easily put myself in the shoes of those who are in discomfort	**1 2 3 4 5**
13. I try to be close to and take care of those who are in need	**1 2 3 4 5**
14. I easily share with friends any good opportunity that comes to me	1 2 3 4 5
15. I spend time with those friends who feel lonely	1 2 3 4 5
16. I immediately sense my friends' discomfort even when it is not directly communicated to me	1 2 3 4 5

Note. Only selected items (marked in **bold**) were used for the present study.

Appendix D

Table 8

UCLA Loneliness Scale (Russell et al., 1978)

Statement	Ratings
1. I am unhappy doing so many things alone	OSRN
2. I have nobody to talk to	OSRN
3. I cannot tolerate being so alone	OSRN
4. I lack companionship	OSRN
5. I feel as if nobody really understands me	OSRN
6. I find myself waiting for people to call or write	OSRN
7. There is no one I can turn to	OSRN
8. I am no longer close to anyone	OSRN
9. My interests and ideas are not shared by those around me	OSRN
10. I feel left out	OSRN
11. I feel completely alone	OSRN
12. I am unable to reach out and communicate with those around me	OSRN
13. My social relationships are superficial	OSRN
14. I feel starved for company	OSRN
15. No one really knows me well	OSRN
16. I feel isolated from others	OSRN
17. I am unhappy being so withdrawn	OSRN
18. It is difficult for me to make friends	OSRN
19. I feel shut out and excluded by others	OSRN
20. People are around me but not with me	OSRN

Note. O = *often*, S = *sometimes*, R = *rarely*, N = *never*. The scale for the present study was changed to a 5-point Likert-Scale.