

Loneliness and Suicidal Behavior: A Meta-Analysis

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Abstract. Loneliness is an emotional condition that humans experience as social beings, which can be felt physically and psychologically. Loneliness can have a negative impact on mental health, e.g., causing a sense of isolation, stress, depression, and the development of suicidal tendencies. Several studies have shown variations in the correlation results between loneliness and suicidal behavior. This study aimed to analyze the correlation between loneliness and suicidal behavior across 19 studies (2015–2024) through a meta-analysis. This study used two artifacts, namely sampling and measurement errors. The results of the meta-analysis based on sampling error resulted in a correlation of 0.45, and a correlation of 0.51 was found when accounting for measurement error. The magnitude of the correlation indicates a moderate relationship. Positive correlation results suggest that loneliness can contribute to the emergence of suicidal behavior.

Keywords: loneliness; meta-analysis; suicidal behaviour

Introduction

The World Health Organization (WHO) established loneliness as a priority and policy issue for all age groups due to its significant impact on public health (World Health Organization, 2021). Since the pandemic, attention to loneliness has increased. Loneliness is a major concern because it encompasses various aspects of life, e.g., individual health, social and economic conditions, applicable policies, and public awareness and social support that can be provided. Loneliness can have a serious impact on a person's physical and mental health. Cacioppo and Patrick (2008) revealed that loneliness not only affects behavior but also one's physical condition and can even increase the risk of mortality.

Loneliness refers to the sense of isolation, both physically and emotionally, experienced by humans as social beings (Shafiananta et al., 2024). It can be experienced by individuals when they are alone without anyone around them, or can be understood as subjective emotional feelings when individuals do not feel connected or interrelated to other individuals. The growing modernization and the use of social networks in daily activities have increased the likelihood of one feeling isolated from their surroundings (Mubaroq & Hidayati, 2022; Saleh & Pitriani, 2018; Uswah et al., 2024).

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Contextually, loneliness can be linked to relationships between individuals. Russell and Pang (2016) explained that the quality of one's social relationships affects the level of perceived loneliness. When social relationships do not meet one's expectations, one may feel dissatisfied and experience loneliness. Conversely, if the relationship exceeds one's expectations, the person will be more satisfied and not perceive themselves to be lonely.

Prolonged or unaddressed loneliness can negatively impact mental well-being. The impact may manifest in the form of a sense of isolation, stress, depression, or even the desire to end one's life (Andari, 2018). It can lead to suicide, especially in individuals with suicidal ideation. Wenzel et al. (2009) defined suicide as an act carried out with the aim of ending one's own life.

According to Joiner (2005), two main factors encourage someone to commit suicide, namely perceived burdensomeness and thwarted belongingness. Thwarted belongingness refers to the feeling of not having an attachment to anyone (Forkmann et al., 2020). The person feels isolated not only from the family, but also from friends and the surrounding community.

Several studies have linked loneliness with suicidal behavior. Research conducted by Hilda and Tobing (2021) found a relationship between loneliness and suicidal behavior in children in orphanages. A study by McGillivray et al. (2023) also showed a high correlation between the two variables. However, some studies have found different results. For example, Saputri (2020) reported that the low levels of loneliness and suicide risk are linked with good social relationships in their environment. Wusqa and Novitayani (2022) also found a low or insignificant correlation between loneliness and suicidal behavior. This finding is in line with Russell and Pang (2016), who highlighted that the quality of social relationships affects the level of perceived loneliness.

The difference in results from previous studies may be due to other factors, such as age. Age is thought to moderate the relationship between loneliness and suicidal behavior. It was found that the suicide rate varied according to the age variable (Wang et al., 2021). Bennardi et al. (2019) also found that age acts as a moderating factor in the relationship between loneliness and suicide in the general population. McClelland et al. (2020) conducted a meta-analysis of the relationship between loneliness and suicide, but their study included only 17 studies with an uneven age distribution of participants. Most of the participants were under 18 years old, while the age group of 24–55 years old was not represented. Therefore, further research is needed to understand if age moderates the relationship between loneliness and suicide.

As previously discussed, previous findings have indicated a relationship between loneliness and suicidal behavior. However, there are differences in results regarding the relationship between the two variables. Therefore, researchers sensed the urgency to conduct a meta-analysis study by considering the diversity of each study analyzed. Referring to the opinion of Borenstein et al. (2009), this study also paid attention to the distribution of results from the various studies analyzed. A good meta-analysis, according to Borenstein et al. (2009), takes into account the spread of results from various studies to produce more accurate conclusions. This meta-analysis aimed to account for measurement and sampling errors so that the correlation between loneliness and suicidal behavior could be more precise. The study also analyzed whether age acts as a moderator in the relationship. Thus, the results of this

study can provide greater insight into prevention and intervention efforts for individuals experiencing loneliness or at risk of suicidal behavior.

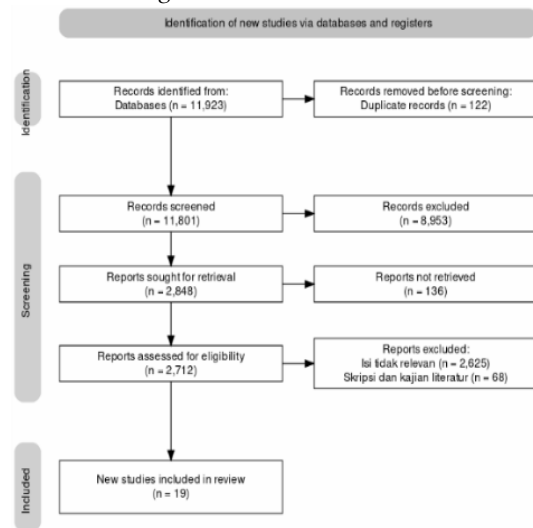
Methods

This study used the meta-analysis approach, which aims to process data from previously conducted studies. This approach is in line with other methods, e.g., systematic literature review, secondary data analysis, and narrative review. Meta-analysis is an approach that uses data from various published studies and processes them systematically and quantitatively to obtain accurate conclusions (Retnawati et al., 2018). It is often used to assess the acceptance or rejection of a hypothesis based on the findings of various studies. According to Schmidt and Hunter (2015), there are three main steps in conducting meta-analysis: (1) searching and collecting relevant studies, (2) extracting and categorizing information from the collected studies, and (3) conducting meta-analysis on extracted information. As a correction for artifacts in the statistical approach, Schmidt and Hunter (2015) argued that measurement error can weaken the calculation of the correlation coefficient. Therefore, taking this into consideration, this study used two measures of artifacts; sampling and measurement errors.

Article searches were conducted through online databases; i.e., Scopus, PubMed, and Google Scholar. The literature search focused on research on the relationship between loneliness and suicidal behavior. The keywords used in the search alluded to “loneliness and suicidal behavior,” as well as the loneliness measurement tool, the UCLA-LS (University of California Los Angeles-Loneliness Scale). Therefore, the keyword searches were “loneliness” AND “suicide” AND “UCLA,” “loneliness” AND “suicidal behavior” AND “UCLA,” and “loneliness” AND ‘suicide’ AND “UCLA.” The search focused on studies using UCLA-LS as the measurement tool for loneliness. UCLA-LS has many versions such as R-UCLA and UCLA-LS version 3. This study chose UCLA as the measurement tool for loneliness because it has been proven to have high validity and reliability (Russell, 1996) and can be used in various age groups, from adolescents to the elderly.

After the articles were collected based on keywords, they were screened using the following inclusion criteria: (1) discussing the role of loneliness on suicidal behavior, (2) using the UCLA as a measure of loneliness, and (3) reporting the correlation coefficient between loneliness and suicidal behavior. The literature search procedure was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 (PRISMA 2020) (Page et al., 2021). Figure 1 shows the study’s PRISMA diagram.

The final number of articles being reviewed was 19. However, one of the articles consisted of three studies, so this meta-analysis was conducted on 21 studies. The total number of research samples amounted to 23,936.

Figure 1*PRISMA Diagram***Table 1***Study Characteristics*

No	Author(s)	N	Instrument (Suicide Scale)	M _{age}	Sample Characteristics	R	r _{xx}	r _{yy}
1	Harris et al. (2015)	359	Suicidal ABC Scale	27.88	195 online volunteering communities, and 164 university students	.51	-	-
2	Xu et al. (2018)	3,480	-	14.50	Middle and high school students aged 10 to 19 years old	.88	-	-
3	Astuti (2019)	42	Adult Suicide Ideation Questionnaire (ASIQ)	25.00	Indonesian migrant workers	.54	.98	.99
4	Ophir et al. (2020)	1,650	Columbia Suicide Severity Rating Scale (CSSRS)	36.45	Facebook users	.35	-	-
5	Yang et al. (2021)	538	Beck Suicide Ideation Scale (BSI-CV)	77.00	People who lived in nursing homes	.48	.96	.92
6	Klein et al. (2021)	2,527	Beck Suicidality-Scale (BSS)	49.37	People aged over 14 years old in Germany	.27	.72	-
7	Lutzman et al. (2021)	198		76.40	Elderly men aged over 65 years old	.20	.84	.89

Table 1 (Continued)*Study Characteristics*

No	Author(s)	N	Instrument (Suicide Scale)	M _{age}	Sample Characteristics	R	r _{xx}	r _{yy}
8	Moore et al. (2021)	160		40.00	Adult male and female inmates	.48	.85	.87
9	Rice et al. (2021)	105	-	69.12	Men with prostate cancer	.37	-	-
10	Alia Ainunnida (2022)	233	-	16.50	Adolescents with divorced parents	.41		
11	Sari et al. (2022)	231	-	20.71	University students in Indonesia	.47	-	-
12	Liem et al. (2022)	5,211	-	21.00	Indonesians aged over 18 years who live in the country	.51	.81	-
13	Lee et al. (2023)	172	The NK-CIDI module on suicide	39.00	North Korean dissidents	.18	.93	-
14	Lin et al. (2023)	397	The suicide module of the Mini-International Neuropsychiatric Interview (MINI)	33.21	Military members (excl. transgender)	.10	-	-
15	Lin et al. (2023)	339		32.68	Gay military members (excl. transgenders)	.08	-	-
16	Lin et al. (2023)	58		32.94	Bisexual military members (excl. transgenders)	.21	-	-
17	Chen et al. (2023)	300	-	45.90	People with schizophrenia	.01	.90	.71
18	Nuñez Fadda et al. (2023)	376	Robert's Suicidal Ideation Scale-Spanish version	20.8	University students in Mexico	.52	.93	.79
19	Akram et al. (2023)	1,408	-	20.94	University students in the UK	.53	.93	.84
20	McClelland et al. (2020)	582	The Suicide Probability Scale	26.93	People aged 18 to 70 years	.04	-	-
21	Pike et al. (2024)	5,211	Hamilton Depression Rating Scale (HAM-D)	40.73	People with bipolar disorder who took part in health control	.33	-	-

N = number of participants, R = correlation coefficient between X and Y, r_{xx} = reliability coefficient of loneliness scale, r_{yy} = reliability coefficient of suicide scale.

The article search was conducted based on several inclusion criteria: (1) journal articles published from 2015 to 2024, (2) loneliness tested using several types of UCLA Loneliness Scale, such as ULS-6, ULS-8, R-UCLA, and UCLA-3, and (3) articles provided information or statistical results needed for analysis, namely testing the role of loneliness as the main factor or as one of the factors of suicidal behavior.

Based on these criteria, 19 suitable journal articles were obtained. The studies listed (Table 1) involved participants from various age groups.

The studies used various measures to assess suicidal behavior. The most widely used measurement tools analyzed in this study were the Beck Suicidality-Scale (BSS) and the Suicide Module of the Mini-International Neuropsychiatric Interview (MINI). Furthermore, this study was analyzed based on a forest plot and meta-regression. A forest plot is needed to understand the summary effect size, where in this plot, each bar shows the value of the confidence interval of the point estimates from each study analyzed (Retnawati et al., 2018). Meta-regression was conducted in this study to analyze age as a moderator variable. The Jamovi program was used to obtain the results of the forest plot and meta-regression. According to Eser (2022), Jamovi is one of the superior programs for meta-analysis.

Results

Based on the studies analyzed in this research, the best correlation estimate is the weighted average, where each correlation is weighted based on the number of samples of each study. This approach assumes that the population correlations are consistent. Analyses in this study included calculation of sampling and measurement errors, as well as meta-regression to assess the role of age as a moderator in the relationship between loneliness and suicidal behavior.

Sampling Error

At this stage, several analyses were carried out, and the results have been summarized in Table 2. Based on the results, the population correlation estimate is 0.450 with a population correlation variance of 0.048. The sampling error variance was 0.001, while the population correlation variance estimate was 0.047. The confidence interval was calculated using the formula $r \pm 1.96SD$, resulting in a range of $0.024 < r < 0.876$. Through the sampling error analysis, it was found that the impact of sampling error on each study was 1.188%.

Table 2

Summary of Sampling Error Results

Calculation	Results
Number of research participants	23,936
Number of studies	21
Population correlation estimate	.450
Population correlation variance	.048
Sampling error variance	.001
Population correlation variance estimate	.047
Confidence interval	.024-.876
Sampling error effect	1.188%

Measurement Error

Errors in any measurement can weaken the correlation coefficient, but since errors are always found in every measurement, measurement error analysis is needed to identify and estimate their impact. This analysis aims to correct for artifacts that may affect the study results. At this stage, several analyses were conducted (Table 3). Based on the results, the weighted means of the two variables studied were 0.870, with a corrected population correlation estimate of 0.517. The analysis of the squared coefficient of variation showed a result of 0.004. The analysis of measurement error variance yielded a result of 0.001, while the true correlation variance was 0.060. Confidence intervals with 95% acceptance were found in the range -0.0331–1.0009. Finally, the impact of reliability variance in this study was recorded at 2.115%.

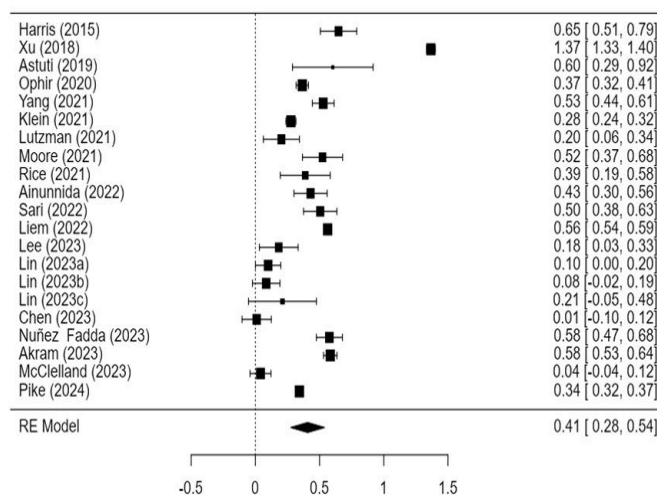
Table 3

Summary of Measurement Error Results

Calculation	Results
Number of research participants	23,936
Number of studies	21
Weighted means	.870
Corrected population correlation estimate	.517
Squared coefficient of variation	.004
Measurement error variance	.001
True correlation variance	.060
Confidence interval	-.0331–1.0009
Reliability variance effect	2.115%

Figure 2

Forest Plot



Based on the results of the forest plot (Figure 2), each study shows a positive correlation between loneliness and suicidal behavior. The results of Chen et al. (2023) found the lowest effect size (0.01) and Xu et al. (2018) study found the highest effect size (1.37). Studies placed on the right side of the criterion line are considered significant, meaning that the variables in the study are considered to have a positive correlation (Retnawati et al., 2018). There are a number of studies on the left side of the criterion line: Chen et al. (2023) and McClelland et al. (2020). It can also be seen that the effect size of Chen et al. (2023) study hits the criterion line. A meta-regression analysis was then conducted by placing age as a moderator (Table 4). The results showed that age does not moderate the relationship between loneliness and suicidal behavior ($Z = -1.61, p = 0.106$).

Table 4*Meta-Regression Analysis on Age*

	Estimate	se	Z	p	CLl	CLu
Intercept	.617	.145	4.25	<.001	.333	.903
Age	-.005	.003	-1.61	.106	-.013	.001

Publication Bias

Retnawati et al. (2018) explained that publication bias can occur because meta-analysis tends to use data from studies that have been published and are considered significant, while insignificant results are often not published. This is one of the weaknesses of the meta-analysis method. Based on the funnel plot test results (Table 5), the Begg and Mazumdar rank correlation value was 0.349 and Egger's regression was 0.484. The p -value of both methods was greater than 0.05, indicating that the funnel plot was formed symmetrically and there was no publication bias (Retnawati et al., 2018; Wahidiah & Rahman, 2021).

Table 5*Calculation of Publication Bias*

Tests	Value	p
Begg and Mazumdar Rank Correlation	.148	.349
Egger's Regression	-.701	.484

Discussion

This meta-analysis examined the relationship between loneliness and suicidal behavior. This means that loneliness experienced can act as a risk factor - even a trigger - for the onset of suicidal behavior. Findings from previous studies have shown inconsistent correlations between these two variables, which may be due to differences in participant characteristics and other contextual variables. Results showed that the correlation analysis after correcting for sampling error ($r=0.45$) was lower than the correlation after correcting for measurement error ($r=0.51$). Based on Cohen's effect size benchmarks (Ellis, 2010), the magnitude of the correlation coefficient is categorized as medium. Thus, the relationship between loneliness and suicidal behavior is deemed to be at a moderate level.

The results of the meta-analysis showed that the correlation obtained based on measurement error is greater than the correlation resulting from sampling error. This is consistent with Atika et al. (2020), who stated that the measurement error will be smaller if the reliability coefficient is greater. In this study there were seven studies that listed the reliability of loneliness and suicidal behavior scales being used. Three of seven studies showed reliability coefficients ranging from 0.72 to 0.93 for both variables. According to Sanaky (2021) reliability above 0.70 is considered satisfactory. This study found that age does not act as a moderator in the relationship between loneliness and suicidal behavior. It aligns with a study conducted by Strizhitskaya and Murtazina (2024), which found that loneliness can be experienced by individuals across age groups. This is also in line with research conducted by Cao et al. (2020), which states that age does not moderate the relationship between loneliness and suicidal behavior.

The phenomenon of loneliness is also widely experienced during the pandemic, especially when lockdown policies were in place. Individuals living with family or other people tend to report lower levels of loneliness than those living alone. Liem et al. (2022) examined loneliness during the COVID-19 pandemic, finding a correlation between loneliness and suicidal behavior. The study showed that loneliness served as a predictor of suicidal ideation during the pandemic. It found that 20.47% of participants experienced severe loneliness, and it became a predictor of suicidal ideation among students (Hamzah & Triwahyuni, 2023). The lack of direct interaction with others and communication that was restricted to online platforms caused loneliness to increase. Rinaldi (2021) also found that 66.95% of students experienced a low level of loneliness, while 19.91% experienced moderate loneliness during the pandemic. Another study in South Korean adolescents by Kim et al. (2023) found a similar result. Loneliness was found as one of the factors associated with suicidal ideation. The study also showed the level of suicidal ideation in adolescents with no experience of loneliness (6.6–8.0%) and those who experienced loneliness (39.6–40.2%). Meanwhile, Shaw et al. (2021) found that men who live alone have a higher risk of suicide than women.

Conclusion

This meta-analysis concluded that loneliness plays a role in suicidal behavior by correcting for sampling and measurement errors. Both corrections were carried out to obtain more accurate correlation results between the two variables, taking into account the variation in the number of samples in the studies analyzed, as well as the reliability of the measurement tools used in those studies. Based on the meta-analysis, the result of the correction for sampling error was $r=0.45$ and the correction for measurement error was $r=0.51$. The limitation of the present study was that it did not include all studies examining the target variables, as some studies could not be accessed or did not report the calculation results needed. The results indicated that loneliness can contribute to or even trigger the onset of suicidal behavior, both in the form of suicidal ideation and suicide attempts.

Recommendation

Based on the limitations of the present meta-analysis, namely the lack of studies analyzing the relationship between loneliness and suicidal behavior as the main variables, the authors suggest that future research can further scan through various sources of journals and research articles discussing related topics.

Declaration

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Author's Contributions

This research article is a result of collaborative writing of two authors. The first author conceptualized the study, and the second author was in charge of analyzing the research data. Both authors worked together to interpret the data and complete the manuscript.

Conflict of Interest

The authors declare no conflict of interest from the start of the research design to the process of manuscript writing.

Declaration of Generative AI in Scientific Writing

The authors declare that no generative artificial intelligence (AI) tools (e.g., ChatGPT, Gemini, or others) were used in the writing of this manuscript.

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