

# VU Research Portal

## The prevalence of suicidal behavior in autism spectrum disorder

Huntjens, Anne; Landlust, Annemiek; Wissenburg, Sophie; Van Der Gaag, Mark

### **published in**

Crisis  
2024

### **DOI (link to publisher)**

[10.1027/0227-5910/a000922](https://doi.org/10.1027/0227-5910/a000922)

### **document version**

Publisher's PDF, also known as Version of record

### **document license**

Article 25fa Dutch Copyright Act

[Link to publication in VU Research Portal](#)

### **citation for published version (APA)**

Huntjens, A., Landlust, A., Wissenburg, S., & Van Der Gaag, M. (2024). The prevalence of suicidal behavior in autism spectrum disorder: A meta-Analysis. *Crisis*, *45*(2), 144-153. <https://doi.org/10.1027/0227-5910/a000922>

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)



# The Prevalence of Suicidal Behavior in Autism Spectrum Disorder

## A Meta-Analysis

Anne Huntjens<sup>1,2</sup> , Annemiek Landlust<sup>3,4</sup>, Sophie Wissenburg<sup>1,2</sup>, and Mark van der Gaag<sup>1,2</sup>

<sup>1</sup>Department of Clinical Psychology, VU University and Amsterdam Public Health Research, Amsterdam, The Netherlands

<sup>2</sup>Department of Psychosis Research, Parnassia Academy, The Hague, The Netherlands

<sup>3</sup>Autism Team Northern-Netherlands, Jonx, Department of (Youth) Mental Health and Autism, Lentis Psychiatric Institute, Groningen, The Netherlands

<sup>4</sup>Department of Genetics, University Medical Center Groningen, The Netherlands

**Abstract:** *Background:* Suicidal ideation (SI) and suicide attempts (SA) are common in autistic individuals, but prevalence rates have not yet been estimated with meta-analysis. *Aims:* This meta-analysis aims to estimate SI and SA prevalence rates in autistic individuals and identify subgroup differences based on sample characteristics and study quality. *Methods:* A systematic search identified 52 studies with 88,509 autistic participants reporting SI and SA. Pooled prevalence estimates were calculated using a random-effects model. *Results:* Pooled prevalence estimates of lifetime SI and SA were 37.2% [95% CI 25.3–50.8] and 15.3% [95% CI 9.5–23.6], respectively. For 12-month prevalence, this was 25.4% [95% CI 19.0–33.2] and 14.1% [95% CI 7.4–25.2], respectively. Subgroup analyses revealed significant differences based on age (SI), region (SI), data collection (SI), measurement scales used to define autism and suicidality (SA), and representation of the study sample (SI and SA). Heterogeneity measures were high for all outcomes ( $I^2 = 60.3–99.1\%$ ). *Limitations:* The heterogeneity of the included studies may limit the generalizability of our findings. *Conclusion:* The high rates of suicidal problems in autistic individuals call for a systematic evaluation of suicidality in clinical practice and adequate therapeutic interventions to improve this condition.

**Keywords:** meta-analysis, prevalence, autism, suicidal ideation, suicide attempts, suicidal behavior

Autistic adults are at increased risk of suicidal ideation (SI) and suicide attempts (SA; Cassidy, Bradley, Shaw, et al., 2018; Cassidy et al., 2014; Hedley, Uljarević, Foley, et al., 2018; Zahid & Uptegrove, 2017). Blanchard et al. (2021) recently published a systematic review and meta-analysis of self-harm and suicidality in autistic adults and children (Blanchard et al., 2021). Autism spectrum disorder (ASD) was associated with increased odds of suicidality (pooled OR, 3.32; 95% CI, 2.60–4.24), but pooled prevalence estimates were not calculated. A recent meta-analysis restricted to autistic youth found prevalence rates of 25.2% for SI and 8.3% for SA (O'Halloran et al., 2022). A characteristic of the published prevalence rates is their extremely wide range. SI prevalence rates range from 7% to 72%, and prevalence rates of SA range from 7% to 47% (Kato et al., 2013; Mikami et al., 2009; Paquette-Smith et al., 2014; Takara & Kondo, 2014; Zahid & Uptegrove, 2017). Pooled prevalence estimates may have smaller 95% confidence intervals and

represent a more realistic prevalence rate, but high heterogeneity is expected. Possible explanations for the wide range of prevalence rates are the varying samples in terms of design, recruitment settings, sample sizes, assessment instruments for ASD, lack of independent verification of ASD diagnosis, and validated suicidality assessment tools across studies (Engström et al., 2003). As a result, it is difficult to discern whether people with a clinical diagnosis of autism are representative of all autistic people (including those who are undiagnosed but would satisfy autism diagnostic criteria were they to be assessed; Loomes et al., 2017).

This meta-analysis primarily aimed to estimate the prevalence rates of SI and SA within 12 months and a lifetime period among autistic individuals. Its secondary aim was to investigate the factors contributing to the varying prevalence estimates between youth and adults through subgroup analyses based on sample characteristics and study quality.

## Methods

This meta-analysis comprises all studies published between 1990 and June 2022 following PRISMA guidelines (Liberati et al., 2009). A protocol for this review was registered at the Open Science Framework (<https://osf.io/9fsd2/>).

### Systematic Search

The systematic literature search was conducted on June 14, 2022, and performed in the following databases: PsychINFO, PubMed, Web of Science, and CINAHL. An initial search was performed using the following terms: (“autism spectrum disorder” [OR] “ASD” [OR] “autism” [OR] “autistic disorder” [OR] “asperger syndrome” [OR] “pervasive developmental disorder”) [AND] (“suicide” [OR] “suicidal ideation” [OR] “suicidal behavior” [OR] “suicidality [OR] “suicide attempts” [OR] “suicidal thoughts”). Reference lists of key review papers were hand-searched. We also performed backward searches, examining reference lists of eligible studies, and forward searches, examining articles that had cited eligible studies.

### Eligibility Criteria

Papers were included if they (1) reported the prevalence of SA and/or SI, regardless of severity measure, in a population of people with a diagnosis of ASD, including autism, Asperger syndrome, and PDD-NOS; (2) included a description of the procedures used to assess SI and SA; and (3) were published in English. As this meta-analysis aimed to assess the prevalence of SI and SA across the whole population of people with ASD, no exclusions were made for age or gender. We excluded research that only focused on nonsuicidal self-injury behavior (NSSI) because this involves deliberate injury to body tissue without suicidal intent (Leo et al., 2006). Death by suicide was only reported in two studies and was not meta-analyzed.

### Study Selection

Figure 1 shows the PRISMA flowchart of the study selection process. Two authors (AH and MvdG) screened all articles. Abstracts were first screened for duplicates and excluded based on the title and abstract if they were not written in English, did not include ASD, or did not assess SI or SA. Full-text papers were screened and were excluded if they did not meet all inclusion criteria.

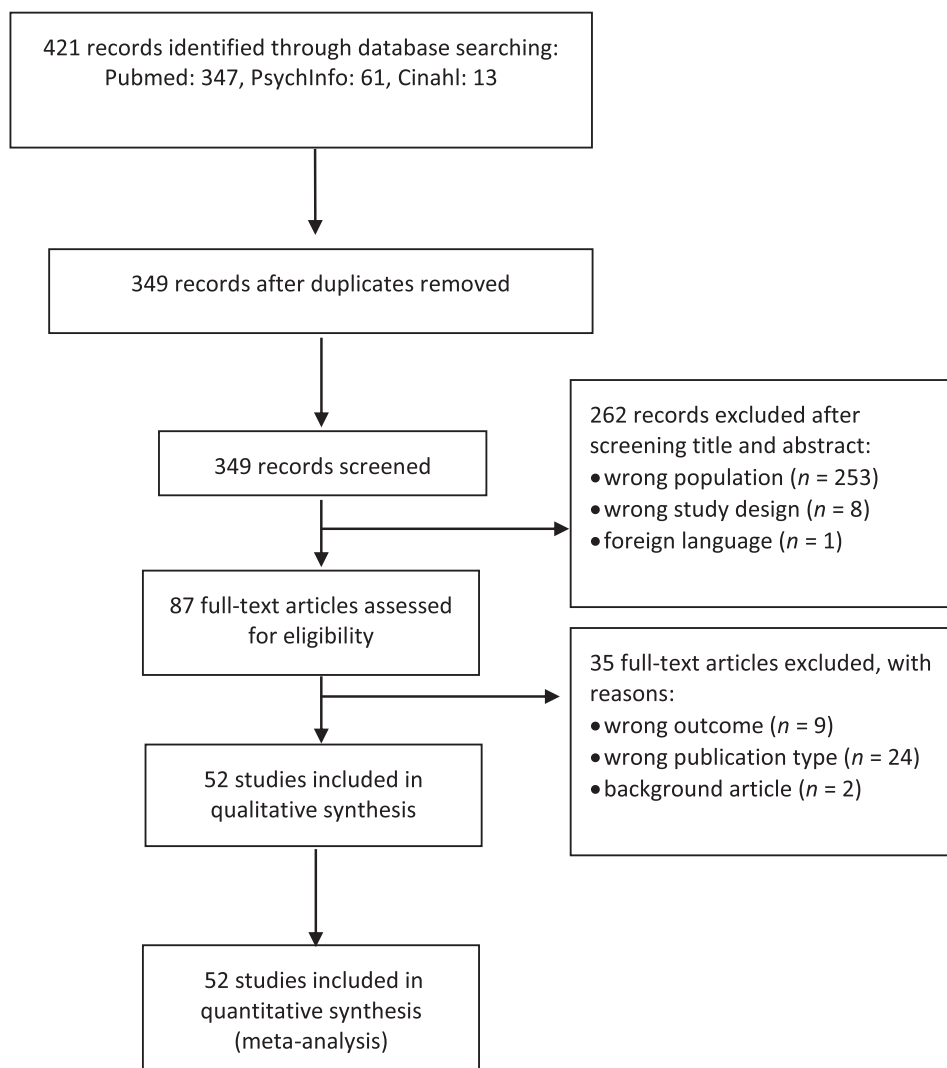
### Data Extraction

Data were independently extracted by two authors (AH and MvdG), including country, study design, sample sizes, source of patients (inpatients, outpatients, community samples), recruitment strategy, mean age (if available), proportion of male gender, diagnostic criteria used, and assessments tools of SI and/or SA. Pooled prevalence estimates were calculated with a random-effects model.

### Risk of Bias Assessment

The quality of included studies was assessed by using Hoy’s risk of bias tool, which was designed for assessing bias in prevalence studies (Hoy et al., 2012). This tool comprises 10 items plus a summary assessment and assesses studies on external (Items 1–4) and internal (Items 5–10) validity. Each study was assigned a score of 1 (*high risk of bias*) or 0 (*low risk of bias*) for each item. These scores were summed for all items to generate an overall quality score that ranged from 1 to 10. A score of 8–10 indicated low risk of bias, 5–7 indicated moderated risk of bias, and 0–4 indicated high risk of bias (Hoy et al., 2012). The following operationalizations were used:

- **Item Representation:** Low risk of bias was attributed to studies when the target population was a close representation of the national population.
- **Item Sampling:** Low risk of bias was attributed to studies when the sampling frame was a close representation of the target population, e.g., population sample and people seeking help. High risk was attributed to clinical groups (inpatients).
- **Item Random Selection:** Low risk of bias was attributed to studies when random selection was used to select the sample or a census was undertaken.
- **Item Nonresponse Bias:** Low risk of bias was attributed to studies when the likelihood of nonresponse bias was minimal. However, many studies did not report this item; as a consequence, we were unable to include this item, indicating this with the term not applicable (N/A).
- **Item Data Collection** evaluates the collection of suicidality data. Low risk of bias was scored for studies that collected reports of suicidality directly from participants.
- **Item Case Definition** evaluates the assessment of ASD. This item was rated as low risk when participants had been diagnosed with ASD according to the diagnostic and statistical manual of mental disorders criteria (DSM-III-V) by a multidisciplinary



**Figure 1.** Flowchart of the study selection process.

team consisting of qualified clinicians experienced in the assessment of ASD. The diagnosis was based on diagnostic interviews with patients and informants. In addition, documented material from education or using the Autism Diagnostic Observation (ADOS, ADOS-2; Lord et al., 1989, 2012) or Autism Diagnostic Interview-Revised (ADI-R; Rutter et al., 2003) was used to confirm diagnostic status.

- **Item Reliability and Validity** evaluates the assessment tools of SI and/or SA. Low risk of bias was attributed to studies that used formal, validated, standardized suicidality assessment tools or combined data from multiple assessments and confirmed these data with a formally validated scale.
- **Item Method of Data Collection:** Low risk of bias was attributed to studies when an active case ascertainment study was used, whereby the individuals in

the study population were assessed for the presence of autism. High risk of bias was attributed to studies when autistic individuals were identified solely based on having a pre-existing diagnosis (passive case ascertainment study; Loomes et al., 2017).

- **Item Prevalence Period:** This item is divided into two time periods: a 12-month and a lifetime prevalence period.
- **Item Numerator and Denominator** was not relevant for the current meta-analysis. Therefore, this item was not included, indicated with the term *not applicable* (N/A).

Two authors (AL and SW) independently conducted the quality assessments, and disagreements were resolved through discussion until consensus was reached.

## Data Synthesis and Meta-Analysis

All meta-analyses were conducted with the Comprehensive Meta-Analysis (CMA) version 3.3.070 computer software package. The prevalence and 95% confidence intervals of SI and SA were calculated using a random-effects model and Freeman–Tukey double arcsine transformation (Freeman & Tukey, 1950). Heterogeneity between studies was assessed using  $\tau^2$  and  $I^2$  statistics, with  $I^2 > 50\%$  indicating high heterogeneity (Higgins et al., 2003), while publication bias was assessed using funnel plots and Egger's test (Egger & Smith, 1997).

## Subgroup Analyses

To explore the sources of heterogeneity, subgroup analyses were performed comparing prevalence estimates in mixed-effects models of categorical variables: youth versus adults and sample characteristics such as source of patients (inpatients vs. outpatients vs. community and clinical vs. community dwellers), region on the globe (Europe vs. North American continent/Australia vs. Turkey/Asia), and risk of bias by using Hoy's risk of bias tool except for three items (Hoy et al., 2012). Two items (nonresponse bias and numerator and denominator faults) were not relevant in the current meta-analysis. The impact of relevant factors on the prevalence of SI and SA in autism, such as psychiatric comorbidity, cognitive ability, and socioeconomic and environmental variables, could not be examined due to the lack of studies reporting the necessary statistics.

Multivariate meta-regression was used to examine interstudy heterogeneity in SI and SA prevalence estimates based on the reported percentage of male gender and publication year.

## Results

### Study Selection

The search resulted in 421 papers. After removing duplicates, 349 remained for abstract screening of which 262 were excluded because they did not meet the meta-analysis selection criteria, leaving 87 full-text papers for examination. We read full texts of 87 papers for eligibility; seven papers did not have data on SI or SA, 24 reported overlapping samples but examined different associations (e.g., non-suicidal self-injury without suicidal intent), and four were review articles. Finally, 52 papers met all eligibility criteria and were included in the meta-analysis (see Figure 1).

## Study Characteristics and Quality Assessment

The characteristics and references of the selected papers are shown in Tables E1 and E2 in Electronic Supplementary Material 1 (ESM 1). The studies were conducted in 10 countries between January 1990 and June 2022. A total of 88,509 individuals with ASD were included. The age range was between 5 and 65 years. The studies were conducted in the United States ( $n = 17$ ); the United Kingdom ( $n = 7$ ); Australia ( $n = 6$ ); Japan, Turkey, Canada, and the Netherlands ( $n = 3$ ); France, Italy, and Taiwan ( $n = 2$ ); and Korea, Singapore, Denmark, and Sweden ( $n = 1$ ). Age was evenly distributed in the studies: 22 focused on adults and 30 examined youth. Suicide assessment included self-report/parent report, medical record review, single-item measures, and clinical evaluation. Of the studies, 28 examined SI, 10 examined SA, and 14 assessed both SI and SA. A range of diagnostic assessments was used to assess ASD and included DSM-IV, DSM V, ICD-9, or ICD-10 diagnostic criteria, medical record review, clinical judgment, the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001), ADOS-Autism Behavior Checklist (ABC; Krug et al., 1980), Checklist for Autism Spectrum Disorder (CASD; Mayes, 2012), Krug Asperger's Disorder Index (KADI; Krug & Arick, 2003), Autism Diagnostic Interview-Revised (ADI-R; Lord et al., 1994), and the Autism Diagnostic Interview Schedule (ADOS, ADOS -2, ADOS-G; Lord et al., 1989; Lord et al., 2012).

The quality assessment resulted in 45 studies with low risk of bias and seven studies with a moderate risk of bias (see Table E3 in ESM 1).

## Pooled 12-Month and Lifetime Suicidal Ideation and Suicide Attempt Prevalence Estimates

Table 1 presents a range of random-effect prevalence estimates, varying from 37.2% for lifetime SI to 14.1% for lifetime SA. Pooled estimates for lifetime SI and SA were more prevalent compared to 12-month estimates (see Figures E1–E4 in ESM 1 for forest plots). Table 2 presents additional analysis by age. Measures of heterogeneity ranged from 0.00–98.5%, indicating estimates of prevalence may be biased by the presence of uncontrolled or confounding factors.

## Subgroup Analyses of Sample Characteristics

The prevalence estimates of SI were statistically significantly higher in adults compared to youth (48.9% vs.

**Table 1.** Pooled random-effect prevalence estimates of 12-month and lifetime suicidal ideation and suicide attempts in autistic individuals

Variable	k	Prevalence			Heterogeneity			p-value across 12 months and across lifetime
		%	95% CI	Q-test	<i>p</i>	<i>I</i> <sup>2</sup>		
12 months								
Suicidal ideation	25	25.4	[19.0–33.2]	412.81	.000	94.1	.109	
Suicide attempt(s)	6	14.1	[7.4–25.2]	12.60	.027	60.3	.834	
Lifetime								
Suicidal ideation	17	37.2	[25.3–50.8]	764.12	.000	97.9		
Suicide attempt(s)	18	15.3	[9.5–23.6]	2073.49	.000	99.1		

Note. k = number of studies; 95% CI = 95% confidence interval; Q = test for heterogeneity.

**Table 2.** Pooled random-effect estimates by age

	Youth							Adults						
	Prevalence			Heterogeneity			p-value across 12 months and lifetime	Prevalence			Heterogeneity			p-value across 12 months and lifetime
	k	%	95% CI	Q-test	<i>p</i>	<i>I</i> <sup>2</sup>		k	%	95% CI	Q-test	<i>p</i>	<i>I</i> <sup>2</sup>	
12 months														
Suicidal ideation	18	20.6	[15.0–27.5]	245.100	.000	93.6	.912	7	42.0	[26.8–59.0]	56.357	.000	89.35	.284
Suicide attempt(s)	4	10.6	[2.6–34.5]	11.765	.008	74.50	.638	2	17.9	[13.0–24.1]	0.124	.725	0.00	.751
Lifetime														
Suicidal ideation	8	21.0	[16.1–26.9]	53.480	.000	86.91		9	53.8	[40.6–66.5]	124.300	.000	93.56	
Suicide attempt(s)	5	7.3	[3.6–14.4]	220.160	.000	98.18		13	19.8	[11.1–32.7]	841.940	.000	98.57	

Note. k = number of studies; 95% CI = 95% confidence interval; Q = test for heterogeneity.

20.7%,  $p < .000$ ; see Table E4 in ESM 1) and comparable for SA (19.4% vs. 8.4%,  $p = .034$ ; see Table E5 in ESM 1). Regional differences in SI were also statistically significant with European prevalence estimates (38.8%,  $p = .005$ ) surpassing those of North American continent/Australia (27.9%) and Turkish/Asian populations (20.2%; see Table E4 in ESM 1).

### Subgroup Analyses of Study Quality in Suicidal Ideation

There were significant differences in two risk of bias items: representation and data collection (see Table E4 in ESM 1). The representation item showed higher prevalence estimates in patient populations compared to the general population. Data collection had higher prevalence estimates in self-report than in other reports. There were no significant differences in sampling, random selection, case definition, assessment tools, method of data collection, or the quality of studies.

### Subgroup Analyses in Study Quality in Suicide Attempts

There were significant differences in four risks of bias items: representation, data collection, ASD case definition, and quality of suicidality assessment tools (see Table E5 ESM 1). The representation item showed higher prevalence estimates in patient populations compared to the general population. Data collection had higher prevalence estimates in self-report than in other reports. The ASD case definition with no risk of bias had higher prevalence estimates in properly diagnosed ASD participants. Validated and reliable assessment tools yielded higher statistical prevalence estimates compared to unvalidated assessment tools.

### Meta-Regression Analyses

The meta-regression analysis revealed that the associations between publication year for SI (see Figure E5 in ESM

1) and SA (see Figure E6 in ESM 1) were nonsignificant. In addition, prevalence estimates for SI (see Figure E7 in ESM 1) and SA (see Figure E8 in ESM 1) were associated with gender. As the percentage of men in the sample increased, the prevalence of SI and SA decreased significantly.

## Publication Bias

The funnel plots for 12-month suicidal ideation and suicide attempts were symmetrical, suggesting no publication bias. Similarly, quantitative assessments of publication bias were not significant ( $p = .145$  and  $p = .234$  for Egger's weighted regression analysis, respectively; see Figures E9 and E10 in ESM 1). The funnel plots for lifetime suicidal ideation and suicide attempts were symmetrical, suggesting no publication bias. Similarly, quantitative assessments of publication bias were not significant ( $p = .215$  and  $p = .224$  for Egger's weighted regression analysis, respectively; see Figures E11 and E12 in ESM 1).

## Discussion

To our knowledge, this is the first meta-analysis to estimate the prevalence of SI and SA in autistic individuals over a 12-month and a lifetime period across all age groups. Pooled estimates for 12 months (SI: 25.4%, SA: 14.1%) and the lifetime (SI: 37.2%, SA: 15.3%) were consistently higher than the general population's estimates of 2.0% for SI and 0.3% for SA over 12 months (Borges et al., 2010) and 9% for SI and 3% for SA over a lifetime (Castillejos et al., 2021). These results confirm the substantial magnitude of SI and SA in autistic people.

## Key Findings

The meta-analysis revealed several key findings. The first finding indicates that prevalence estimates of SI were significantly higher in autistic adults compared to youth, with rates of 42% versus 20.6% at 12 months and 53.8% versus 21.0% over a lifetime. This is probably due to the broader age range of the adults. The prevalence estimates for SA showed a similar pattern in lifetime estimates (19.8% in adults vs. 7.3% in youth) and 17.9% in adults and 10.6% in youth at 12 months. The lifetime prevalence of SI (21.6%) and SA (7.3%) in youth was found to be higher compared to adolescents in the general population, with SI at 12.1% and SA at 4.1% (Nock et al., 2013). Furthermore, our prevalence in youth is consistent with data from a meta-analytical study on lifetime estimates in autistic

adolescents ( $\leq 25$  years) with the SI of 25.2% and SA of 8.3% (O'Halloran et al., 2022).

A second key finding is that autistic individuals in Europe were statistically more likely to have SI than those from the North American continent, Australia, or Asia and Turkey. This is probably due to a majority of adult studies in Europe (8/14) and a minority of adult studies in the North American continent/Australia (7/22) and Turkey/Asia (1/6). It was observed that adults have a higher prevalence of suicidal ideation than youth.

A third key finding is that the prevalence estimates for SI and SA were higher in patient populations compared to the general population (representation item). Of course, patient populations exhibit more symptoms, problems, and suicidality compared to the general population.

A fourth key finding is that there were no significant differences in the recruitment setting. Nonhelp-seeking autistic individuals in the community showed similar rates compared to help-seeking autistic individuals in mental health services. There were also no differences between inpatients, outpatients, and community dwellers.

## Sources of Heterogeneity

The sources of heterogeneity were representation, data collection, case definition, and the quality of the assessment tools. Many studies in this meta-analysis used measures to assess SI and/or SA without any evidence of validity or used one single question only on a short subscale of a broader mental health measure (e.g., MINI, BDI, PHQ-9; Cassidy, Bradley, Bowen, et al., 2018). Nonvalidated suicidality measures in any population lead to significantly lower estimates of SI and SA than tools with proper validity, suggesting that nonvalidated tools may underestimate suicidality in autistic individuals. Additionally, the instruments with a low risk of bias have not been validated in autistic people (Cassidy, Bradley, Bowen, et al., 2018). Therefore, using standardized instruments designed to assess SI and SA in autistic people is crucial to avoid missed cases. Furthermore, studies where suicidality was not the primary outcome but rather a secondary one may have underestimated suicidality by using a single item from a questionnaire.

Another source of heterogeneity is significant discrepancies between child- and parent-reported suicidal ideation (Storch et al., 2013). In the present meta-analysis, studies utilizing self-reported data on SI and SA yielded significantly higher prevalence estimates than studies relying on caregiver-reported data. Factors such as parents' limited awareness of their child's thoughts (Moretti et al., 1985) may bias the prevalence findings. This indicates that self-report may offer a more accurate

representation of the internal experiences of suicidality in autistic people, emphasizing the importance of obtaining additional supporting evidence alongside informant reports when employing this approach.

A third source of heterogeneity was the degree of exposure to risk factors for suicidality. Potential risk factors for SI and SA in autistic individuals include social factors; social isolation, loneliness, a lack of social support (Cassidy et al., 2020; Hedley, Uljarević, Wilmot, et al., 2018; Pelton & Cassidy, 2017), camouflaging autistic traits, feelings of thwarted belonging with poor mental health (Cassidy, Bradley, Shaw, & Baron-Cohen, 2018; Cassidy et al., 2020), and a lack of acceptance in society (Cage et al., 2018). Potential risk factors also include psychological factors such as peer victimization, low mood (Mazefsky, 2015), repetitive behaviors and rumination, self-esteem (Arwert & Sizoo, 2020), impulsivity (Mazefsky, 2015), and alexithymia (Costa et al., 2020). We included studies in which participants had little exposure to risk factors, while others involved participants who were exposed to many risk factors (Moseley et al., 2020).

A fourth source of heterogeneity is the lack of a gold standard instrument to classify ASD. Multiple standardized diagnostic instruments are still used, which may cause variation in classification. Comorbid psychiatric disorders are common in autistic people, with nearly 70% of autistic people experiencing at least one disorder and 40% having two or more (DeFilippis, 2018). This leads to underclassification of autism in both community and clinical study populations (Engström et al., 2003; Lai et al., 2017). In addition, there is under-reporting of autistic women with medium-to-high intelligence, who may be overlooked due to male-targeted diagnostic profiling or camouflage, resulting in delayed diagnosis until adulthood (Van Wijngaarden-Cremers et al., 2014).

## Strengths and Limitations

The results of the meta-analysis should be interpreted with caution due to the high heterogeneity observed in all prevalence estimates. This is a common occurrence in prevalence meta-analyses, including studies reporting the prevalence of SI and SA in autistic adults, which results in wide confidence intervals of the prevalence. In subgroup analyses, only a few sources of heterogeneity were identified. The quality of the suicidality assessment instrument was the most powerful factor that could reduce heterogeneity, although it remained high.

A second limitation of our report is its focus on the wide eligibility criteria that resulted in variations in methodologies, samples, designs, and diagnostic instruments for ASD, leading to high heterogeneity measures for all outcomes.

Additionally, the data reported by the included studies were often incomplete and did not provide specific data required for meta-regression. The assessment of SI and SA also varied in terms of quality as standardized assessment suicidality tools differed between studies. Consequently, reports of SI and SA were dichotomized into the presence or absence of these behaviors, failing to provide information on their frequency and severity.

A third limitation is that all included studies were cross-sectional, and no longitudinal studies have been conducted to assess SI and SA over time in autistic individuals or to determine a primary age of onset of suicidality in ASD.

A fourth limitation is that most of the eligible articles involved clinical study populations. Table E1 in ESM 1 shows that out of the 52 selected studies, 36 (69%) were related to clinical populations, including 10 inpatients, 23 outpatients, 2 with outpatients and community, and 1 national register of inpatients and outpatients. Clinical populations are unlikely to be representative of all autistic individuals. However, subgroup analyses revealed no significant differences in the prevalence of SI and SA for clinical patients compared to the community sample (see Tables E4 and E5 in ESM 1).

A fifth limitation is that no single eligible study was included that measured the prevalence of SI and SA in older adults (i.e.,  $\geq 65$  years). This demonstrates a clear gap in the current research literature.

Despite these limitations, a strength of this review and meta-analysis is that this is the first attempt to statistically estimate the 12-month and lifetime prevalence of SI and SA in autistic adults and youth. A second strength is that this meta-analysis covers the full range of demographic population characteristics, including males and females in all age groups.

## Conclusions

The current meta-analysis reported 12-month and lifetime pooled prevalence estimates for SI and SA in autistic individuals. Among youth, the 12-month prevalence estimates for SI and SA were 20.6% and 10.6%, respectively, while the lifetime prevalence estimates were 21.6% and 7.3%, respectively. For adults, the 12-month prevalence estimates for SI and SA were 42.0% and 17.9% with corresponding lifetime prevalence estimates of 53.8% for SI and 19.8% for SA. By utilizing non-standardized and nonvalidated tools for classifying suicidality in autistic individuals, along with relying on caregiver reports and employing various diagnostic instruments for ASD, there has been a risk for underestimation of suicidality.

The overall high rates of suicidal problems in autistic people call for routine evaluation of suicidality in clinical practice and adequate therapeutic options to improve this hazardous situation. It is strongly recommended that the field develops and validates measures of suicidality. In the future, with the availability of more studies with improved scientific rigor, the heterogeneity should be reduced, resulting in more accurate estimates and hopefully reducing suicidal risk in this vulnerable population.

To conclude, we recommend (1) the use of validated suicidality assessment tools for use in autistic populations, (2) the use of active classification of ASD, and (3) adequate data collection, including direct reports of suicidality from individuals, in future prevalence studies.

## Electronic Supplementary Material

The electronic supplementary material is available with the online version of the article at <https://doi.org/10.1027/0227-5910/a000922>

**ESM 1.** Characteristics and references of the selected studies, Hoy's Risk of Bias, subgroup overview of SI and SA, forest plots for 12-month and lifetime SI and SA, logistics model on publication year and gender in SI and SA, and funnel plots for 12-month and lifetime SI and SA.

## References

- Arwert, T. G., & Sizoo, B. B. (2020). Self-reported suicidality in male and female adults with autism spectrum disorders: Rumination and self-esteem. *Journal of Autism and Developmental Disorders*, 50(10), 3598–3605. <https://doi.org/10.1007/s10803-020-04372-z>
- Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism-spectrum quotient (AQ): Evidence from asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of Autism and Developmental Disorders*, 31(1), 5–17. <https://doi.org/10.1023/A:1005653411471>
- Blanchard, A., Chihuri, S., DiGiuseppi, C. G., & Li, G. (2021). Risk of self-harm in children and adults with autism spectrum disorder: A systematic review and meta-analysis. *JAMA Network Open*, 4(10), Article e2130272. <https://doi.org/10.1001/jamanetworkopen.2021.30272>
- Borges, G., Nock, M. K., Haro Abad, J. M., Hwang, I., Sampson, N. A., Alonso, J., Andrade, L. H., Angermeyer, M. C., Beautrais, A., Bromet, E., Bruffaerts, R., de Girolamo, G., Florescu, S., Gureje, O., Hu, C., Karam, E. G., Kovess-Masfety, V., Lee, S., Levinson, D., ..., & Kessler, R. C. (2010). Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. *Journal of Clinical Psychiatry*, 71(12), 1617–1628. <https://doi.org/10.4088/JCP.08m04967blu>
- Cage, E., Di Monaco, J., & Newell, V. (2018). Experiences of autism acceptance and Mental Health in autistic adults. *Journal of Autism and Developmental Disorders*, 48(2), 473–484. <https://doi.org/10.1007/s10803-017-3342-7>
- Cassidy, S. A., Bradley, L., Bowen, E., Wigham, S., & Rodgers, J. (2018). Measurement properties of tools used to assess suicidality in autistic and general population adults: A systematic review. *Clinical Psychology Review*, 62, 56–70. <https://doi.org/10.1016/j.cpr.2018.05.002>
- Cassidy, S. A., Bradley, L., Shaw, R., & Baron-Cohen, S. (2018). Risk markers for suicidality in autistic adults. *Molecular Autism*, 9(1), Article 42. <https://doi.org/10.1186/s13229-018-0226-4>
- Cassidy, S. A., Bradley, P., Robinson, J., Allison, C., McHugh, M., & Baron-Cohen, S. (2014). Suicidal ideation and suicide plans or attempts in adults with Asperger's syndrome attending a specialist diagnostic clinic: A clinical cohort study. *Lancet Psychiatry*, 1(2), 142–147. [https://doi.org/10.1016/S2215-0366\(14\)70248-2](https://doi.org/10.1016/S2215-0366(14)70248-2)
- Cassidy, S. A., Gould, K., Townsend, E., Pelton, M., Robertson, A. E., & Rodgers, J. (2020). Is camouflaging autistic traits associated with suicidal thoughts and behaviours? Expanding the interpersonal psychological theory of suicide in an undergraduate student sample. *Journal of Autism and Developmental Disorders*, 50(10), 3638–3648. <https://doi.org/10.1007/s10803-019-04323-3.2020>
- Castillejos, M. C., Huertas, P., Martín, P., & Moreno Küstner, B. (2021). Prevalence of suicidality in the European general population: A systematic review and meta-analysis. *Archives of Suicide Research*, 25(4), 810–828. <https://doi.org/10.1080/13811118.2020.1765928>
- Costa, A. P., Loor, C., & Steffgen, G. (2020). Suicidality in adults with autism spectrum disorder: The role of depressive symptomatology, alexithymia, and antidepressants. *Journal of Autism and Developmental Disorders*, 50(10), 3585–3597. <https://doi.org/10.1007/s10803-020-04433-3>
- DeFilippis, M. (2018). Depression in children and adolescents with autism spectrum disorder. *Children (Basel)*, 5(9), Article 112. <https://doi.org/10.3390/children5090112>
- Egger, M., & Smith, G. D. (1997). Meta-analysis: Potentials and promise. *BMJ*, 315(7119), 1371–1374. <https://doi.org/10.1136/bmj.315.7119.1371>
- Engström, I., Ekström, L., & Emilsson, B. (2003). Psychosocial functioning in a group of Swedish adults with Asperger syndrome or high-functioning autism. *Autism*, 7(1), 99–110. <https://doi.org/10.1177/1362361303007001008>
- Freeman, M. F., & Tukey, J. W. (1950). Transformations related to the angular and the square root. *The Annals of Mathematical Statistics*, 21(4), 607–611. <https://doi.org/10.1214/aoms/117729756>
- Hedley, D., Uljarević, M., Foley, K. R., Richdale, A., & Trollor, J. (2018). Risk and protective factors underlying depression and suicidal ideation in Autism Spectrum Disorder. *Depression and Anxiety*, 35(7), 648–657. <https://doi.org/10.1002/da.22759>
- Hedley, D., Uljarević, M., Wilmot, M., Richdale, A., & Dissanayake, C. (2018). Understanding depression and thoughts of self-harm in autism: A potential mechanism involving loneliness. *Research in Autism Spectrum Disorders*, 46, 1–7. <https://doi.org/10.1016/j.rasd.2017.11.003>
- Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, 327(7414), 557–560. <https://doi.org/10.1136/bmj.327.7414.557>
- Hoy, D., Brooks, P., Woolf, A., Blyth, F., March, L., Bain, C., Baker, P., Smith, E., & Buchbinder, R. (2012). Assessing risk of bias in prevalence studies: Modification of an existing tool and evidence of interrater agreement. *Journal of Clinical Epidemiology*, 65(9), 934–939. <https://doi.org/10.1016/j.jclinepi.2011.11.014>
- Kato, K., Mikami, K., Akama, F., Yamada, K., Maehara, M., Kimoto, K., Kimoto, K., Sato, R., Takahashi, Y., Fukushima, R., Ichimura, A., & Matsumoto, H. (2013). Clinical features of suicide attempts in adults

- with autism spectrum disorders. *General Hospital Psychiatry*, 35(1), 50–53. <https://doi.org/10.1016/j.genhosppsych.2012.09.006>
- Krug, D. A., & Arick, J. (2003). *Krug Asperger's Disorder Index (KADI)*. Pro-Ed.
- Krug, D. A., Arick, J., & Almond, P. (1980). Behavior checklist for identifying severely handicapped individuals with high levels of autistic behavior. *Journal of Child Psychology and Psychiatry*, 21(3), 221–229. <https://doi.org/10.1111/j.1469-7610.1980.tb01797.x>
- Lai, M. C., Lombardo, M. V., Ruigrok, A. N., Chakrabarti, B., Auyeung, B., Szatmari, P., Happé, F., & Baron-Cohen, S., & MRC AIMS Consortium (2017). Quantifying and exploring camouflaging in men and women with autism. *Autism*, 21(6), 690–702. <https://doi.org/10.1177/1362361316671012>
- Leo, D. D., Burgis, S., Bertolote, J. M., Kerkhof, A. J. F. M., & Bille-Brahe, U. (2006). Definitions of suicidal behavior: Lessons learned from the WHO/EURO multicentre Study. *Crisis*, 27(1), 4–15. <https://doi.org/10.1027/0227-5910.27.1.4>
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Journal of Clinical Epidemiology*, 62(10), e1–e34. <https://doi.org/10.1016/j.jclinepi.2009.06.006>
- Loomes, R., Hull, L., & Mandy, W. P. L. (2017). What is the male-to-female ratio in autism spectrum disorder? A systematic review and meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*, 56(6), 466–474. <https://doi.org/10.1016/j.jaac.2017.03.013>
- Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. L. (2012). *Autism diagnostic observation schedule, second edition*. Western Psychological Services.
- Lord, C., Rutter, M., Goode, S., Heemsbergen, J., Jordan, H., Mawhood, L., & Schopler, E. (1989). Autism diagnostic observation schedule: A standardized observation of communicative and social behavior. *Journal of Autism and Developmental Disorders*, 19(2), 185–212. <https://doi.org/10.1007/BF02211841>
- Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders*, 24(5), 659–685. <https://doi.org/10.1007/BF02172145>
- Mayes, S. D. (2012). *Checklist for autism spectrum disorder*. Stoelting.
- Mazefsky, C. A. (2015). Emotion regulation and emotional distress in autism spectrum disorder: Foundations and considerations for future research. *Journal of Autism and Developmental Disorders*, 45(11), 3405–3408. <https://doi.org/10.1007/s10803-015-2602-7>
- Mikami, K., Inomata, S., Hayakawa, N., Ohnishi, Y., Enseki, Y., Ohya, A., Haruki, Y., Kishi, Y., Shinohara, Y., Ichimura, A., & Matsumoto, H. (2009). Frequency and clinical features of pervasive developmental disorder in adolescent suicide attempts. *General Hospital Psychiatry*, 31(2), 163–166. <https://doi.org/10.1016/j.genhosppsych.2008.12.003>
- Moretti, M. M., Fine, S., Haley, G., & Marriage, K. (1985). Childhood and adolescent depression: Child-report versus parent-report information. *Journal of the American Academy of Child Psychiatry*, 24(3), 298–302. [https://doi.org/10.1016/s0002-7138\(09\)61090-6](https://doi.org/10.1016/s0002-7138(09)61090-6)
- Moseley, R. L., Gregory, N. J., Smith, P., Allison, C., & Baron-Cohen, S. (2020). Links between self-injury and suicidality in autism. *Molecular Autism*, 11(1), Article 14. <https://doi.org/10.1186/s13229-020-0319-8>
- Nock, M. K., Green, J. G., Hwang, I., McLaughlin, K. A., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2013). Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: Results from the National comorbidity Survey Replication adolescent supplement. *JAMA Psychiatry*, 70(3), 300–310. <https://doi.org/10.1001/2013.jamapsychiatry.55>
- O'Halloran, L., Coey, P., & Wilson, C. (2022). Suicidality in autistic youth: A systematic review and meta-analysis. *Clinical Psychology Review*, 93, Article 102144. <https://doi.org/10.1016/j.cpr.2022.102144>
- Paquette-Smith, M., Weiss, J., & Lunsy, Y. (2014). History of suicide attempts in adults with Asperger syndrome. *Crisis*, 35(4), 273–277. <https://doi.org/10.1027/0227-5910/a000263>
- Pelton, M. K., & Cassidy, S. A. (2017). Are autistic traits associated with suicidality? A test of the interpersonal-psychological theory of suicide in a non-clinical young adult sample. *Autism Research*, 10(11), 1891–1904. <https://doi.org/10.1002/aur.1828>
- Rutter, M., Le Couteur, A., & Lord, C. (2003). *ADI-R Autism diagnostic interview – revised*. Psychological Services.
- Storch, E. A., Sulkowski, M. L., Nadeau, J., Lewin, A. B., Arnold, E. B., Mutch, P. J., Jones, A. M., & Murphy, T. K. (2013). The phenomenology and clinical correlates of suicidal thoughts and behaviors in youth with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 43(10), 2450–2459. <https://doi.org/10.1007/s10803-013-1795-x>
- Takara, K., & Kondo, T. (2014). Comorbid atypical autistic traits as a potential risk factor for suicide attempts among adult depressed patients: A case-control study. *Annals of General Psychiatry*, 13(1), Article 33. <https://doi.org/10.1186/s12991-014-0033-z>
- Van Wijngaarden-Cremers, P. J. M., van Eeten, E., Groen, W. B., Van Deuren, P. A., Oosterling, I. J., & Van der Gaag, R. J. (2014). Gender and age differences in the core triad of impairments in autism spectrum disorders: A systematic review and meta-analysis. *Journal of Autism and Developmental Disorders*, 44(3), 627–635. <https://doi.org/10.1007/s10803-013-1913-9>
- Zahid, S., & Upthegrove, R. (2017). Suicidality in Autistic spectrum disorders. *Crisis*, 38(4), 237–246. <https://doi.org/10.1027/0227-5910/a000458>

## History

Received August 25, 2022

Revision received June 23, 2023

Accepted June 23, 2023

Published online September 5, 2023

## Conflict of Interest

The authors have no relevant financial or nonfinancial interests to disclose.

## Authorship

Anne Huntjens: conceptualization, methodology, writing – original draft, formal analysis; Mark van der Gaag, conceptualization, methodology, writing – original draft, formal analysis; Annemiek Landlust, methodology, review & editing; Sophie Wissenburg, methodology, review & editing. All authors contributed to and have approved the final manuscript.

## Funding

No funding was received for conducting this study.

## ORCID

Anne Huntjens

 <https://orcid.org/0000-0002-0520-9212>

**Anne Huntjens**

Department Clinical Psychology  
Vrije Universiteit Amsterdam  
De Boelelaan 1105  
1081 HV Amsterdam  
The Netherlands  
a.huntjens@vu.nl

Anne Huntjens, MSc, works as a psychotherapist and a dialectical behavior therapy (DBT) trainer and is a PhD candidate affiliated with Vrije Universiteit Amsterdam and the Mark van der Gaag Institute Research Center at Parnassia Group, the Netherlands. She is leading a multicenter clinical trial to evaluate the effectiveness of DBT for suicidal behavior in autistic individuals (DIASS).

Annemiek Landlust, a health care psychologist and PhD candidate, affiliated with the Autism Team North Netherlands and the Department of Clinical Genetics at the University Medical Center Groningen, focuses on investigating rare genetic syndromes linked to both intellectual disability and autism in her doctoral research.

Sophie Wissemburg is a master's student at VU University Amsterdam, where she studies philosophy, bioethics, and health. In addition to her academic pursuits, she is involved as a research assistant at the Parnassia Group with the study DIASS, dialectical behavioral therapy for autism patients with suicidality and self-destructive behavior.

Mark van der Gaag, PhD, is an emeritus professor at the Department of Clinical Psychology, Vrije Universiteit Amsterdam, the Netherlands. He does research in clinical trials, psychiatry, and abnormal psychology.

https://recontent.hogrefe.com/doi/pdf/10.1027/0227-5910/a000922 - Anne Huntjens <a.huntjens@vu.nl> - Sunday, November 10, 2024 2:12:45 AM - IP Address: 2a02:a46b:7888:1:51b0:f3ae:f179:b7c