

Risk factors for suicide reattempt: a systematic review and meta-analysis

Review Article

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Corresponding author:

Alejandro de la Torre-Luque;
Email: af.delatorre@ucm.es

Andres Pemau¹ , Carolina Marin-Martin², Marina Diaz-Marsa^{3,4}, Alejandro de la Torre-Luque^{1,2} , Wala Ayad-Ahmed³, Ana Gonzalez-Pinto^{2,4,5}, Nathalia Garrido-Torres^{2,6,7}, Lucia Garrido-Sanchez⁶, Natalia Roberto^{8,9,10}, Purificación Lopez-Peña^{2,4,5,11}, Lorea Mar-Barrutia^{2,4,5,11}, Iria Grande^{2,8,9,10}, Marti Guinovart^{12,13}, Daniel Hernandez-Calle^{14,15}, Luis Jimenez-Treviño^{2,16,17,18,19}, Clara Lopez-Sola^{2,8}, Roberto Mediavilla^{2,20}, Adrian Perez-Aranda²¹, Miguel Ruiz-Veguilla^{2,6,7,22}, Elisa Seijo-Zazo^{16,17,18,19}, Alba Toll^{13,23}, Matilde Elices^{2,13,23}, Victor Perez-Sola^{2,23,24,25}, Jose Luis Ayuso-Mateos^{2,20} and the SURVIVE Consortium

¹Universidad Complutense de Madrid, Madrid, Spain; ²Centre for Biomedical Research in Mental Health (CIBERSAM), Madrid, Spain; ³San Carlos University Clinic Hospital, Madrid, Spain; ⁴Araba University Hospital, Vitoria, Spain; ⁵University of the Basque Country, Bilbao, Spain; ⁶Virgen del Rocio University Hospital, Seville, Spain; ⁷Seville Biomedical Research Institute (IBiS), Seville, Spain; ⁸Bipolar and Depressive Disorders Unit, Hospital Clinic de Barcelona, Barcelona, Spain; ⁹Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain; ¹⁰Departament de Medicina, Facultat de Medicina i Ciències de la Salut, Universitat de Barcelona (UB), Barcelona, Spain; ¹¹BIOARABA, Vitoria, Spain; ¹²Institut d'Investigació i Innovació ParcTauli (I3PT), Barcelona, Spain; ¹³Autonomous University of Barcelona, Barcelona, Spain; ¹⁴La Paz University Hospital, Madrid, Spain; ¹⁵Hospital La Paz Institute for Health Research (IdiPAZ), Madrid, Spain; ¹⁶Servicio de Salud del Principado de Asturias (SESPA), Oviedo, Spain; ¹⁷Principado de Asturias Health Research Institute (ISPA), Oviedo, Spain; ¹⁸University of Oviedo, Oviedo, Spain; ¹⁹Principado de Asturias Neuroscience Research Institute (INEUROPA), Oviedo, Spain; ²⁰Autonomous University of Madrid, Madrid, Spain; ²¹IIS Aragon Research Foundation, Zaragoza, Spain; ²²University of Seville, Seville, Spain; ²³Neurosciences Research Unit, IMIM-Institut Hospital del Mar d'Investigacions Mèdiques, Barcelona, Spain; ²⁴Hospital de Mar, Mental Health Institute, Barcelona, Spain and ²⁵Department of Experimental and Health Sciences, Pompeu Fabra University, Barcelona, Spain

Abstract

Background. Suicide is one of the main external causes of death worldwide. People who have already attempted suicide are at high risk of new suicidal behavior. However, there is a lack of information on the risk factors that facilitate the appearance of reattempts. The aim of this study was to calculate the risk of suicide reattempt in the presence of suicidal history and psychosocial risk factors and to estimate the effect of each individual risk factor.

Methods. This systematic review and meta-analysis were conducted following the PRISMA-2020 guidelines. Studies on suicide reattempt that measured risk factors were searched from inception to 2022. The risk factors studied were those directly related to suicide history: history of suicide prior to the index attempt, and those that mediate the transition from suicidal ideation to attempt (alcohol or drug misuse, impulsivity, trauma, and non-suicidal self-injury).

Results. The initial search resulted in 11 905 articles. Of these, 34 articles were selected for this meta-analysis, jointly presenting 52 different effect sizes. The pooled effect size across the risk factors was significant (OR 2.16). Reattempt risk may be increased in presence of any of the following risk factors: previous history, active suicidal ideation, trauma, alcohol misuse, and drug misuse. However, impulsivity, and non-suicidal self-injury did not show a significant effect on reattempt.

Conclusion. Most of the risk factors traditionally associated with suicide are also relevant when talking about suicide reattempts. Knowing the traits that define reattempters can help develop better preventive and intervention plans.

Introduction

Suicide is one of the main external causes of death worldwide. The world health organization [WHO] has tracked suicide trends over the years and has pointed out the need to act urgently to tackle suicide impact worldwide (WHO, 2014). Thus, in their latest seminal report, the WHO reported that suicide accounted for more than 700 000 deaths in 2019 (WHO, 2023).

Even then, deaths by suicide are just the tip of the iceberg. Other suicide-related behaviors, such as suicidal attempts or ideation (while not strictly a behavior) have much higher

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prevalence (Nock *et al.*, 2008; WHO, 2014). Previous attempts are one of the most relevant risk factors for death by suicide (Mendez-Bustos, De Leon-Martinez, Miret, Baca-Garcia, & Lopez-Castroman, 2013). A recent meta-analysis suggests that one in five people who attempts suicide could repeat it (de la Torre-Luque *et al.*, 2023).

Risk factors for suicidal behavior represent a highly relevant line of work. Considering variables associated with suicidal history, the effect of ideation (at different levels of structuring) and the presence of multiple attempts are well established (De La Garza, Blanco, Olfson, & Wall, 2021; Mendez-Bustos *et al.*, 2013). Other psychosocial aspects such as non-suicidal self-injury, trauma, or high impulsivity are also relevant (Daray *et al.*, 2016; Hawton, Saunders, & O'Connor, 2012; Ng, Yong, Ho, Lim, & Yeo, 2018; Zatti *et al.*, 2017). Socio-demographic factors have also been studied: with respect to sex, there are more deaths by suicide in men but more attempts in women. Regarding age groups, young people and the elderly represent special risk groups (WHO, 2014).

However, despite knowing these suicide attempt risk factors, the knowledge is not directly transferable to reattempts (Mendez-Bustos *et al.*, 2013). Some relevant risk factors in a first attempt may not be so when repeating. Studies in this regard are fewer, and there is a lack of clear evidence on the weight of each risk factor in successive attempts throughout life. In addition, the differences in terms of sample and methodology make it difficult to obtain clear conclusions (de la Torre-Luque *et al.*, 2023).

There are two groups of particularly interesting variables when talking about reattempt. On one hand, those related to the person's own history of suicide. These variables have been associated with the so-called acquired capability for suicide. This concept is related to the habituation to suicide and the fearlessness of death or pain (Klonsky, Saffer, & Bryan, 2018). On the other hand, the volitional risk factors. This term refers to those variables that predict the transition from suicidal ideation to suicide attempt in the Integrated Motivational-Volitional Model (O'Connor & Kirtley, 2018).

Further precise knowledge of how risk factors differ between first attempters and reattempters could help provide more personalized help. The study has two main objectives:

- 1) Calculate the risk of suicide reattempt in the presence of suicidal history and psychosocial risk factors.
- 2) Estimate the magnitude of the effect of each risk factor.

Methods

This study followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Protocols 2020 (PRISMA 2020) statement (Page *et al.*, 2021).

Article selection criteria

The PICOS (Population, Intervention, Comparison, Outcomes and Study) matrix guided the selection of the units of analysis. Starting with the population, studies with human participants of all ages who had attempted suicide (index attempt) and were admitted to a hospital department due to this attempt, were selected. Regarding intervention, participants had to be assessed with respect to suicidality. In terms of control criteria, studies should have either (a) a control group of individuals who engaged in a suicide attempt without reattempting; (b) a baseline assessment of reattempters in longitudinal studies. Regarding outcome

criteria, studies had to include a measure of reattempt risk and information on at least one of these risk factors:

- Those directly related to suicide history: previous suicide attempts (attempts prior to the index one) and suicidal ideation.
- Those that facilitate the transition from suicidal ideation to attempt (whether related to impulse control or exposure to pain): alcohol misuse, drug misuse, non-suicidal self-injury, trauma, or impulsivity.

Finally, regarding study criteria, longitudinal studies (both prospective and retrospective) published in Spanish or English until March 2022 were considered. Studies with cross-sectional measures were discarded.

Search strategy and data extraction

Studies were located following an ascendant approach. The consulted databases were: Web of Science, PubMed, PsycInfo, SCOPUS, CINAHL, and the Cochrane Library. The search was done by combining the following keywords: Suicide attempt and repetition. The exact searches can be found in online Supplementary Table S1 of the supplementary materials.

Found papers were screened, collecting titles, abstracts, and keywords. Next, the papers selected in the first step were read in full, to decide if they were included. An independent peer reviewer endorsed the selection of every paper to be included. In case of discrepancies, they were resolved by discussion.

Relevant data were extracted from each article using a coding manual, made purposely. Data collected from each study covered bibliometric features (i.e. year of publication, country), methodological features of the study (i.e. sample size, mean age of participants, sex ratio), suicide-related features (suicidal ideation, previous suicide history), and other relevant psychological traits (alcohol or drugs misuse, trauma, non-suicidal self-injury, and impulsivity). All risk factors were measured at baseline.

The Newcastle – Ottawa Quality Assessment Scale (NOS) (Wells *et al.*, 2000) was used to measure the methodological quality of the studies.

Data analysis

Multilevel mixed-effects meta-regression was used to estimate the overall repetition Odds Ratio (OR), derived from pooling risk estimates from each primary study. Heterogeneity among the individual effect sizes was analyzed by means of the Cochran's Q statistic and the Higgins and Thompson I^2 statistic (Higgins & Thompson, 2002; Higgins, Thompson, Deeks, & Altman, 2003).

Sensitivity analysis was conducted for each of the risk factors separately (the high variability between risk factors in each study prevented combined meta-regression techniques). OR was used as a measure of effect size for the individual factor effect size. The varying effect size estimates (relative risk, hazard ratio, or Cohen's d) from the individual studies were transformed into a common metric (OR).

When the same study included samples with several risk factors, all of them were included. If the study featured treatments, only the control groups were used. Finally, if there were several temporal follow-ups, only the longest one was considered.

The restricted maximum-likelihood estimator was used to estimate overall effect size and variance (under the inverse variance

method). The forest plot was used to visually display the individual effect sizes (presented for sensitivity analysis).

Publication bias was studied by means of Egger's regression asymmetry test.

All the analyses were conducted using the software R (R Core Team, 2017) version 4.2.2, with packages meta and metaphor.

Results

The initial search resulted in 11 905 articles. After removing duplicates, 3672 abstracts were screened. Of those, 651 articles were read in full, and 34 papers presented data relevant to the study, jointly presenting 52 different effect sizes. Table 1 shows the characteristics of each of the studies. In cases where a study measured different risk factors, it appears several times, showing in each case the size of the relevant effect. Figure 1 shows the article selection flowchart.

Most studies came from France (23.53%), followed by Taiwan (11.8%), Spain, and Sweden (8.8% in both cases). Almost 60% of the works were published after 2013. The follow-up period ranged from 3 to 328 months ($M = 40.40$, $s.d. = 63.17$, $Median = 13$). The articles considered a total sample size of 103 601 attempters ($M = 3047.09$, $s.d. = 14 009.69$, $Median = 216.5$). The mean age of participants was 34.33 years old ($s.d. = 10.29$, $Median = 37.08$).

First, the multilevel mixed-effects model was carried out without introducing moderators ($\sigma^2 = 0.28$, $OR = 2.16$, $CI_{95} [1.75-2.68]$, $Z = 7.12$, $p < 0.01$). High heterogeneity was observed ($Q = 652.87$, $p < 0.01$).

Then, regarding the multilevel mixed-effects meta-regression, an analysis was carried out introducing the percentage of women in the sample, the follow-up period, and the mean age as covariates. This model showed a random-effects variance of $\sigma^2 = 0.18$; and $Q_M(3) = 3.03$, $p = 0.39$. No covariate showed a significant loading in the model. Egger's regression pointed to the possible existence of bias ($Z = 3.17$, $p < 0.01$).

Since the diverse specific risk factors of each sample cannot be included in the same model (each study uses a different one, which would prevent joint analyses), we then opted for sensitivity analysis with the different risk factors.

The sensitivity analyses focused on specific risk factors are presented below. The most studied risk factor in the literature was the history of suicide prior to the index attempt ($k = 23$). The effect of suicide attempt history on reattempt was significant ($OR = 2.85$, $CI_{95} [2.19-3.71]$, $Z = 7.78$, $p < 0.01$). Heterogeneity was significant ($Q = 87.14$, $p < 0.01$, $I^2 = 78.24\%$).

Regarding studies focused on the presence of active ideation at baseline ($k = 7$), a significant OR was found ($OR = 2.05$, $CI_{95} [1.24-3.40]$, $Z = 2.78$, $p < 0.01$). Between-study heterogeneity was high ($Q = 45.18$, $p < 0.01$, $I^2 = 97.97\%$).

Regarding alcohol misuse, seven studies analyzed its role as a risk factor for suicide reattempts. The analysis showed a significant OR for alcohol misuse ($OR = 2.16$, $CI_{95} [1.63-2.86]$, $Z = 5.34$, $p < 0.01$). Heterogeneity was, again, significant ($Q = 20.87$, $p < 0.01$, $I^2 = 61.72\%$).

The studies that considered other drug use as a risk factor ($k = 4$) are presented now. The OR for the samples with drug use was also significant ($OR = 2.29$, $CI_{95} [1.33-3.93]$, $Z = 2.99$, $p < 0.01$). In this case, the heterogeneity was not significant ($Q = 3.57$, $p = 0.31$, $I^2 = 20.72\%$).

Lastly, the effect of trauma was significant when it came to suicide reattempt ($k = 5$, $OR = 1.58$, $CI_{95} [1.12-2.24]$, $Z = 2.58$, $p < 0.01$). Cochran's Q wasn't significant ($Q = 3.36$, $p = 0.49$,

$I^2 = 0\%$). It should be clear that all the included studies spoke of trauma as a lifetime experience of sexual trauma.

The risk factors that did not show significant results are now discussed. Only one paper studied the relationship between non-suicidal self-injury and suicide reattempt. This precludes the use of meta-analytic techniques. The only study that provided this data was that of Mirkovic et al. (2020). In their sample, an OR 1.15 was obtained. The effect was not significant.

Five studies focused on the role of impulsivity. The analyses did not show a relevant role for this risk factor ($OR = 1.28$, $CI_{95} [0.52-3.18]$, $Z = 0.54$, $p = 0.59$). Cochran's Q was significant ($Q = 26.52$, $p < 0.01$, $I^2 = 86.69\%$). A sensitivity analysis was performed eliminating the study by Aydin, Algin, Poyraz, and Kalenderoglu (2018) as it was the only one that had an Odds Ratio less than 1. In this way, a significant effect was found ($OR = 1.80$, $CI_{95} [1.04, 3.11]$, $Z = 2.09$, $p < 0.05$). Cochran's Q was not significant ($Q = 6.31$, $p = 0.10$, $I^2 = 53.46\%$).

The forest plot corresponding to each risk factor can be seen in the supplementary materials (online Supplementary Figs S1 to S6).

Discussion

Risk factors studied in first suicide attempts are partially replicated when we talk about repeat attempts. However, non-suicidal self-injury and impulsivity do not have the same relevance in reattempt. Our meta-analysis also reveals that there are various understudied risk factors in the field of suicide reattempt, for example, non-suicidal self-injury.

This study aimed to find a robust global estimate of the effect of different suicide histories and psychological risk factors on suicide reattempts, and their individual contributions. For this, a robust methodology and a large number of studies were used ($k = 34$). The extensive initial search has allowed us to obtain results on a wide range of risk factors.

Previous studies showed that an index attempt acts as the key single risk factor for suicide attempt repetition. In this regard, a previous meta-analysis stressed that one in five people will engage in another suicide attempt later in life (de la Torre-Luque et al., 2023). The risk factors studied here can help determine which profiles are more prone to reattempt. Our results indicate that people who present any of the studied risk factors have a double risk of suicide reattempt. The high variability between effect sizes makes it necessary to focus on which specific factors pose a greater risk. As can be seen, not all factors are equally relevant.

Starting with the factors associated with the suicide history itself, the most studied risk factor is the presence of previous attempts. It should be noted that most studies consider the inclusion of a participant after an index attempt, the index attempt is not necessarily the first one. Those who made attempts prior to the index have an increased risk of repetition. This phenomenon could be related to the acquired capacity for suicide raised in the ideation to action framework. The concept of major repeaters could also be relevant (Blasco-Fontecilla et al., 2014; Irigoyen-Otiñano et al., 2018). Not all studies reported the exact number of lifetime attempts.

The presence of active ideation at the time of the baseline measurement is also a relevant risk factor. From the action ideation models, the part related to ideation is considered relevant (O'Connor & Kirtley, 2018). Maintaining ideation even after the attempt could lead to new attempts in the future. However, there is some variability in the measures used and even in the

Table 1. Features of studies

Study	Country	Follow-up length (in months)	Sample size	Sex (% female)	Sample age (mean)	Risk factor	OR	Variance
Aguglia et al. (2020)	Italy	6	432	77.1	49.13	History	7.10	0.278
Ahmed et al. (2020)	Saudi Arabia	36	157	76.4	17.84	Drugs	1.23	0.511
						Trauma	2.57	0.265
Allard, Marshall, and Plante (1992)	Canada	24	126	56	NA	Drugs	3.29	0.288
Aydin et al. (2018)	Turkey	NA	103	70.9	27.86	Impulsivity	0.26	0.137
Azcárate-Jiménez et al. (2019)	Spain	6	207	58.94	45.05	History	1.58	0.162
Batt et al. (1998)	France	6	632	63	34.6	History	3.63	0.084
						Alcohol	1.93	0.072
						Impulsivity	1.50	0.085
Beautrais (2004)	New Zealand	60	226	53.6	30.4	History	2.65	0.077
						Trauma	1.80	0.078
Beckman et al. (2019)	Sweden	6	176	73.3	40.2	Impulsivity	1.01	0.111
Chen et al. (2013)	Taiwan	6	1056	68.4	38	History	2.27	0.038
Courtet et al. (2004)	France	12	103	82.5	37.08	Impulsivity	3.90	0.431
De Beurs et al. (2016)	UK	15	366	56.8	35.8	Ideation	4.51	0.234
de Beurs, van Borkulo, and O'Connor (2017)	Netherlands	15	366	57.1	35	History	3.26	0.570
Demesmaeker, Chazard, Vaiva, and Amad (2021)	France	6	972	63.6	38	Alcohol	2.92	0.050
Dieserud et al. (2003)	Norway	18	50	66	41	History	3.89	1.247
						Ideation	1.60	0.169
Espandian et al. (2020)	Spain	12	319	74.3	41.5	History	1.52	0.156
Finkelstein et al. (2016)	Canada	132	81 675	61.8	31	Alcohol	1.49	0.001
Fossi, Debien, Demarty, Vaiva, and Messiah (2022)	France	6	10 666	58.7	40.6	History	2.93	0.006
Fridell, Öjehagen, and Träskman-Bendz (1996)	Sweden	60	42	58.7	40.5	History	2.14	0.410
Garrido Romero et al. (2004)	Spain	12	43	87	15.6	History	21.07	2.265
Groholt, Ekeberg, and Haldorsen (2006)	Norway	109	78	90	16.9	History	4.76	0.247
						Trauma	0.74	0.132
Huang et al. (2020)	Taiwan	328.33	151	30.5	52.9	Alcohol	1.78	0.154
						Drugs	1.54	0.146
Hultén et al. (2001)	Sweden	46	1264	72.38	NA	History	3.22	0.024
Jaar et al. (1998)	Chile	84	92	100	37	History	3.83	0.224
Lee et al. (2012)	Taiwan	12	102	68.6	39.9	History	30.40	1.091
						Ideation	3.97	0.146
						Impulsivity	2.90	0.142
Lee et al. (2019)	Republic of Korea	13	691	57.4	46.02	Alcohol	2.56	0.071

(Continued)

Table 1. (Continued.)

Study	Country	Follow-up length (in months)	Sample size	Sex (% female)	Sample age (mean)	Risk factor	OR	Variance
Ligier, Guillemin, Angot, Bourion, and Kabuth (2015)	France	120	246	81	14.8	History	1.23	0.083
						Trauma	0.89	0.158
Mirkovic et al. (2020)	France	12	91	86.7	NA	non-suicidal self-injury	1.16	0.208
						Ideation	1.92	0.172
Monnin et al. (2012)	France	24	273	69.2	37.6	History	1.92	0.083
						Alcohol	2.34	0.127
Mouaffak, Marchand, Castaigne, Arnoux, and Hardy (2015)	France	12	151	73.5	38.6	History	5.80	0.340
O'Connor et al. (2015)	UK	15	367	56.7	34.19	History	1.42	0.009
						Ideation	1.05	0.000
Vajda and Steinbeck (2000)	Australia	12	112	67.86	18.05	History	1.01	0.255
						Alcohol	4.47	0.215
						Drugs	3.80	0.200
						Trauma	1.79	0.210
Wang et al. (2016)	Taiwan	3	64	73.4	37.5	History	9.50	1.428
Wei et al. (2021)	China	93	1103	63.74	36.96	History	3.43	0.130
						Ideation	1.06	0.003
Wong et al. (2008)	USA	12	1099	33.3	14.61	History	12.61	0.213
						Ideation	4.29	0.095

¹Country of the correspondence author's affiliation.

concepts measured. Some tests focus on suicidal ideation (e.g. De Beurs, Fokkema, & O'Connor, 2016; O'Connor, Smyth, & Williams, 2015) and others on suicidal intent (e.g. Dieserud, Røysamb, Braverman, Dalgard, & Ekeberg, 2003; Wei et al., 2021). It is necessary to systematize these measures to obtain more precise conclusions.

Both alcohol and drug misuse are also a relevant risk factors for suicide reattempts. A previous meta-analysis already found similar results when considering full-blown substance disorders (de la Torre-Luque et al., 2023). This risk factor should not be confused with the involvement of substances during the attempt.

Finally, the presence of trauma was also a significant risk factor for suicide reattempt. It is relevant to point out that the included studies can be interpreted as physical or sexual abuse throughout life (some studies considered only childhood and others lifetime). There may be differential functioning between trauma in adult life and that which occurs during childhood (Zatti et al., 2017). Studies in this regard seem necessary.

All the factors mentioned have presented the expected relationship. They also coincide with the investigations on first attempts. However, the levels of impulsivity and non-suicidal self-injury did not show a significant role in our study.

Beginning with non-suicidal self-injury, only one study measured the relationship between it and suicide reattempt (Mirkovic et al., 2020). Therefore, meta-analytic analyses could

not be carried out. The existing study does not find non-suicidal self-injury as a relevant risk factor. The scarce presence of this risk factor in the studies is striking.

Regarding impulsivity, no significant OR was found when the full sample of studies was used. The literature focused on the first attempts finds that it is a relevant factor (Liu, Trout, Hernandez, Cheek, & Gerlus, 2017). In part, these discrepancies could be due to the high conceptual variability associated with impulsivity in the field of suicide (Rimkeviciene, O'Gorman, & De Leo, 2015). In our case, we found studies that considered behavioral impulsivity compared to others that spoke of the impulsivity of the index attempt (the separate analyses were not significant either). When performing the sensitivity analysis, a relevant effect of impulsivity was found. The retrospective nature of the discarded study (Aydin et al., 2018) could explain this discrepancy. The temporal distance between the measure of impulsivity and the attempt could explain the non-appearance of a relationship (Liu et al., 2017).

We can observe that there is a very high heterogeneity of terminology, methodology, and focus of study. Systematizing these aspects could help draw stronger conclusions that help guide future studies.

The study has some limitations to be mentioned. First, only published articles were consulted. Second, there could be publication bias that affected the results. Third, it was necessary to group

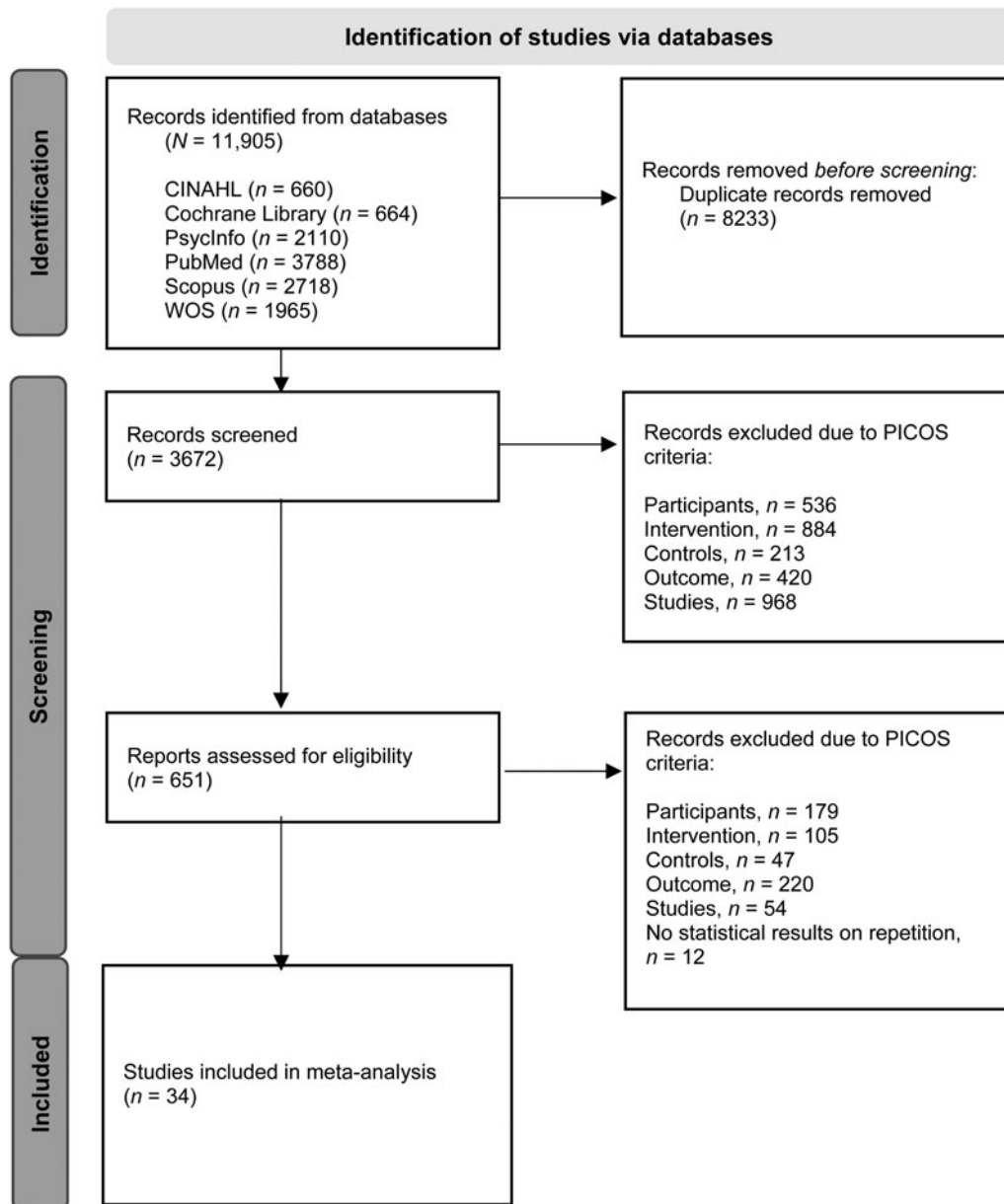


Figure 1. Flow diagram of studies selected for this meta-analysis.

many studies with definitions or measures of constructs that were not exactly the same (although equivalent). This could have masked some differences present, although attempts have been made to control for it using sensitivity analyses. Also, some variables were only considered in very few studies, making it difficult to draw strong conclusions. Given the variability between studies, analyses could not be carried out by taking different risk factors together. Finally, the heterogeneity between effect sizes was not completely covered by moderators in analysis. Specifically, there are relevant variables not studied in this work, such as diagnoses (for an in-depth work on this topic, consult the work of de la Torre-Luque et al., 2023).

Not all people who made a first suicide attempt will reattempt. The presence of multiple previous attempts is the most relevant risk factors for suicide reattempt. There is a relevant overlap between the variables that facilitate the transition from suicidal

ideation to act and those present in the reattempt. However, variables widely considered important in first suicide attempts are not so decisive when reattempting (i.e. impulsivity and non-suicidal self-injury). This study allows us to further define the risk profile for patients with several suicide attempts, which may facilitate the development of more effective interventions and preventive strategies.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S0033291724000904>

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The works indicated with an asterisk are those used in the meta-analysis itself.

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