Psychological Pain in Suicidality:
A Meta-Analysis

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ABSTRACT

Objective: Perform a meta-analysis to quantify the association between psychological pain and current or lifetime history of suicidal ideation or suicide attempt.

Data Sources: Search MEDLINE, Web of Science, and PsycINFO from 1965 to 2015 for (*psychache* OR *mental pain* OR *psychological pain*) AND (*suicid**).

Study Selection: Observational case-control studies addressing the difference in psychological pain between individuals with and without current or lifetime history of suicidal ideation or suicide attempt.

Data Extraction: Data were independently extracted into a standard electronic form. All authors were contacted for unpublished data related to current or lifetime history of suicide ideation or attempt.

Data Synthesis: Twenty studies were included. Comparisons concerned 760 subjects with versus 8,803 subjects without lifetime history of suicide attempt; 344 subjects with versus 357 patients without current suicide attempt; 262 patients with versus 64 patients without lifetime history of suicidal ideation; and 551 subjects with versus 7,383 subjects without current suicidal ideation. The intensity of psychological pain was higher (1) in both subjects with lifetime history of suicide attempts and subjects with current suicide attempts versus without (effect sizes = 0.72, $P < 10^{-2}$ and 0.66, $P < 10^{-2}$, respectively) and (2) in both subjects with lifetime history of suicide ideation and subjects with current suicidal ideation versus without (effect sizes = 1.49, $P = .01$ and 1.15, $P < 10^{-2}$, respectively). Association between psychological pain and suicidality remained significant even when depression levels were not different between subjects.

Conclusions: Higher psychological pain levels are associated with suicidal ideation and acts. Considering psychological pain to be at the core of suicidality is important for daily clinical practice and for the promotion of innovative therapeutic strategies for suicide prevention.

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Every year, 1 million people die by suicide worldwide, and nearly 20 times that number attempt suicide.[1] The commonly accepted "stress-diathesis" model suggests that the suicidal act results from a complex interaction between vulnerability factors (diathesis) and environmental events or psychiatric diseases (stress).[2] Suicidal behavior disorder, defined as the presence of a suicide attempt within the past 2 years, was included in the *DSM-5* ("conditions for further study" section) as an independent clinical entity[3] due to the large amount of evidence demonstrating a specific suicidal physiopathology. Despite a real increase in the effective pharmacologic treatments available for psychiatric diseases associated with an increased suicidal risk, the reported rates of suicidal ideation, suicide attempts, and completed suicides have not substantially decreased in recent years.[4] Thus, new hypotheses to better understand suicidality are needed and may lead to improved therapeutic strategies to prevent suicide.

As proposed by Shneidman,[5] psychological pain is at the core of the suicidal process, ranging from suicidal ideation to suicide. Psychological pain is defined as an extreme and aversive emotionally based feeling, experienced as a lasting, unsustainable, and unpleasant condition resulting from negative appraisal or deficiency of the self.[6] Psychological pain, which can become unbearable in some patients, is the reason most often reported for suicide.[7] Indeed, some persons may view completed suicide as a means to alleviate a painful internal state.[8] In other words, the suicidal act becomes a problem-solving behavior to "stop the painful flow of consciousness."[9] The role of painful defeat or entrapment in the suicidal process has been highlighted by the "cry of pain" model.[10] Motivations to escape from painful self-awareness have been emphasized in the escape theory of suicide.[11]

Although not always replicated,[12,13] a relationship between psychological pain and suicide attempts[14–37] and suicidal ideation[22,24–26,38–42] was indeed reported. The level of psychological pain could predict suicidal ideation and action.[18] Yet, psychological pain has not been associated with either medical severity of suicide attempt[29,30] or frequent recurrence of suicide attempts.[37] Overall, findings suggest the involvement of a higher perception of or lower tolerance to psychological pain as a main factor for suicidal vulnerability.[43] Nevertheless, these studies involved small sample sizes that limit the strength of these correlations; furthermore, depression could be a confounding factor between suicidality and psychological pain. Moreover, different scales and heterogeneous suicidal phenotypes were

used. Thus, it is yet impossible to obtain reliable results and extrapolate them to better understand the suicidal process. To overcome these limitations, we conducted a meta-analysis to quantify the association between psychological pain and current or lifetime history of suicidal ideation, as well as current or lifetime history of suicide attempts. We also aimed to disentangle the role of depression in these associations by performing subgroup analyses when possible, depending on depression level, population type, and age.

Clinical Points

- Psychological pain seems to be at the core of the suicidal process, ranging from suicidal ideation to suicide. A meta-analysis was undertaken to overcome the limitations of previous studies assessing psychological pain in suicidal patients.
- With large effect sizes, psychological pain was higher (1) in subjects with (vs without) both current and lifetime history of suicide attempts and (2) in subjects with (vs without) both current and lifetime history of suicidal ideation. Depression by itself does not explain the association between high psychological pain and suicidality.
- Recognition of psychological pain as core to suicidality is highly relevant in clinical practice and may help promote new therapeutic strategies for preventing suicide.

METHODS

Our meta-analysis was based on the Meta-Analysis of Observational Studies in Epidemiology statement.[44]

Search Criteria

We systematically searched MEDLINE, Web of Science, and PsycINFO from 1965 to November 2015 for the terms (*psychache* OR *mental pain* OR *psychological pain*) AND (*suicid**), based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[45] Within the reviewing team, D.D. and E.O. independently reviewed references and abstracts retrieved by the search, assessed the exhaustiveness of data abstraction, and confirmed quality rating. We used a structured data abstraction form to ensure consistent assessment for each study. Investigators were contacted to provide data to supplement the original articles.

Selection Criteria

Studies were included if they met the following criteria:

1. observational case-control studies addressing the difference in psychological pain between suicidal and nonsuicidal adults or adolescents. (*Suicidality* referred to current and lifetime history of suicidal ideation or attempt. *Current suicidal ideation* indicates presence of suicidal ideation within the past week, independent of the lifetime suicidality status [control group: absence of suicidal ideation within the past week]. *Lifetime suicidal ideation* indicates presence of ever having suicidal ideation in one's lifetime [control group: never had a suicidal ideation in one's lifetime]. *Current suicide attempt* indicates presence of suicide attempt within the past week, independent of the lifetime suicidality status [control group: absence of suicide attempt within the past week]. *Lifetime suicide attempt* indicates presence of ever having a suicide attempt in one's lifetime [control group: never had a suicide attempt in one's lifetime]. *Suicide attempt* was defined as a self-damaging act carried out with some intent to die, distinguished from other self-destructive behaviors such as self-mutilation, noncompliance with medical treatment in severely ill individuals, and substance abuse such as alcohol and tobacco. *Suicidal ideation* was defined as thinking about, considering, or planning suicide and was measured using suicide-related items from the Beck Depression Inventory[46] or the Depression Hopelessness Suicide Screening Form[47] and the Beck Scale for Suicide Ideation [48]);
2. human studies involving adults or adolescents with and without suicidal behavior;
3. measurement of psychological pain with validated scales (Validated scales for psychological pain were Psychache Scale,[14] Shneidman's Psychological Pain Assessment Scale,[9] Orbach and Mikulincer Mental Pain Scale,[28] self-report ratings of Suicide Status Form–psychological pain,[49] Mental Pain Scale,[28] Mee-Bunney Psychological Pain Assessment Scale,[50] and Visual Analog Scale for psychache[38]); and
4. studies in the English language.

Two investigators (D.D. and E.O.) independently assessed the relevant articles. Articles with the following criteria were excluded: (1) absence of nonsuicidality group for comparisons, (2) use of nonvalidated scales for measurement of psychological pain, (3) unavailability of psychological pain scores even after having contacted the authors, and (4) analyses of identical data. This meta-analysis involving data from published studies did not require approval from an institutional review board.

Data Extraction

Data were independently extracted into a standard electronic form: name of first author, publication date, population type, age, gender (percent males), type of suicidal behavior, sample size, psychological pain assessment scale, depression assessment scale, and mean scores (standard deviation [SD]) of psychological pain and depression for each group. All authors were contacted for unpublished data related to lifetime and current history of suicide attempts and lifetime and current history of suicidal ideation.

Methodological Quality Evaluation of the Studies Included

The methodological quality of included studies was assessed independently by 2 of the authors (D.D. and E.O.) using the Newcastle-Ottawa Scale.[51] Any discrepancies were resolved by consensus with a third reviewer (P.C.).

Statistical Analyses

Analyses were performed with comprehensive meta-analysis software (version 2.0, National Institutes of Health).[52] Meta-analyses were conducted when data related to psychological pain were available from 3 or more studies. We calculated standardized mean difference (SMD) with 95% confidence intervals (CIs) for each study, defined as the difference in means between the 2 groups (suicidal subjects and nonsuicidal subjects) divided by the pooled standard deviation of the measurements. We used random-effects models,[53] taking into account between-study heterogeneity by weighing the studies in a similar manner. Heterogeneity was assessed using the I^2 statistic, which represents the percentage of variance between study factors rather than sampling errors.[54] We used funnel plots, Rosenthal fail-safe N (which estimates the number of missing studies needed to change the results of the meta-analysis), and the Egger regression intercept (which assesses the degree of funnel plot asymmetry by the intercept from regression of standard normal deviates against precision) to estimate the risk of bias.

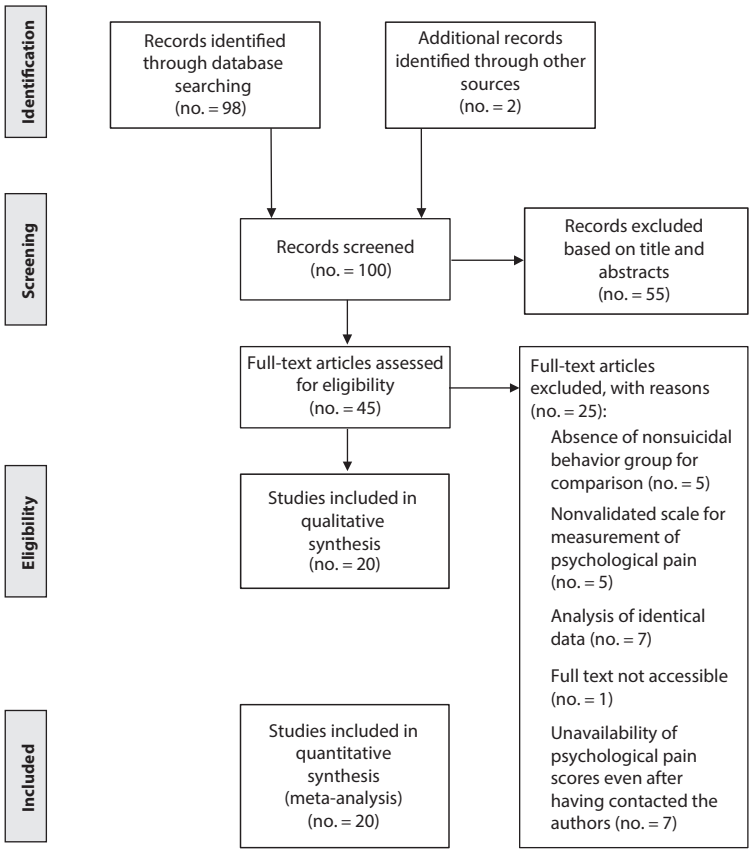
We conducted several subgroup and sensitivity analyses not only to determine the impact of various factors (ie, depression intensity, study sample type [general population or psychiatric patients], and age) on the effect size estimate for psychological pain, but also to explore potential reasons for heterogeneity or inconsistency. We compared effect sizes between subgroups using Cochran *Q* test.

RESULTS

Study Selection

The flowchart of included studies is shown in Figure 1. In total, 100 studies were identified. Eighty of the studies were excluded for the following reasons: (1) title and abstract suggested irrelevant data for the present meta-analysis (55 studies); (2) absence of nonsuicidal behavioral group for comparisons (5 studies)[46,55–58]; (3) use of nonvalidated scales for psychological pain measurement (5 studies)[59–63]; (4) analyses of identical data (7 studies)[17–20,27,64,65]; (5) full text was unavailable (1 study[66]); and (6) psychological pain scores were unavailable even after having contacted the authors several times (7 studies).[8,13,23,26,34,42,50] Notably, we systematically contacted the authors to collect unpublished data: unavailable data from the article and from their sample (lifetime history of and current suicide attempt, lifetime history of and current suicidal ideation). Based on the above criteria, 20 studies were included in the qualitative final synthesis.

Figure 1. PRISMA Flow Diagram of Study Selection



Characteristics and Quality of the Studies

The studies included were heterogeneous in terms of population (undergraduates, psychiatric inpatients, homeless men, and incarcerated offenders). For the subgroup analyses, we performed analyses that addressed the general population and psychiatric patients separately. For age, we calculated the global mean age of patients in the studies to use it arbitrarily as a cutoff to perform analyses in young and older subjects (see Supplementary eTable 1).

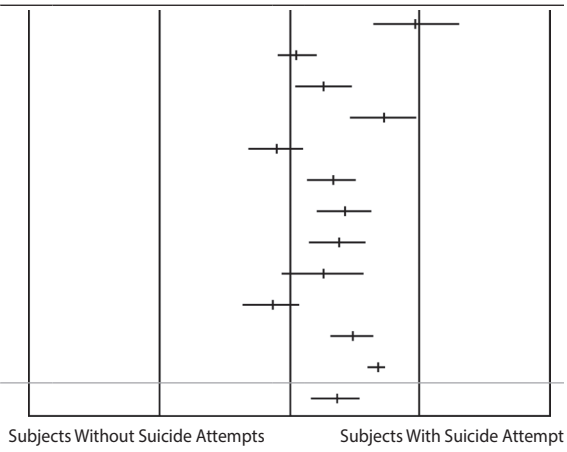
In these studies, psychological pain was assessed with different scales: Psychache Scale,[14–16,21,22,24,25,39,40] Orbach and Mikulincer Mental Pain Scale,[29–31,35,41,67] Likert scales,[38] Mental Pain Scale,[32,33] and Likert scale for Suicide Status Form–psychological pain construct.[36] All studies had a good quality, ranging from 5 to 8[29,30] on the Newcastle-Ottawa Scale.

Comparison of Psychological Pain in Subjects With and Without Lifetime History of Suicide Attempt

A meta-analysis of 12 studies[12,14–16,21,22,24,25,35,38,40,67] involving 760 subjects with versus 8,803 subjects without a past history of suicide attempt was performed. Psychological pain levels were higher in suicide

Figure 2. Psychological Pain Levels in Subjects With Versus Without Lifetime History of Suicide Attempt

Model	Study	Standard Difference in Means	Standard Error	Variance	Lower Limit	Upper Limit	Z Value	P Value
	Cáceda, 2014[25]	1.946	0.334	0.112	1.292	2.601	5.826	.000
	Olié, 2010[38]	0.120	0.151	0.023	−0.177	0.417	0.792	.428
	Li, 2014[40]	0.530	0.221	0.049	0.096	0.964	2.393	.017
	Patterson, 2012[22]	1.471	0.261	0.068	0.960	1.983	5.636	.000
	Pompili, 2008[12]	−0.192	0.215	0.046	−0.614	0.229	−0.894	.371
	Holden, 2001[14]	0.661	0.195	0.038	0.280	1.043	3.399	.001
	Flamenbaum, 2007[15]	0.857	0.213	0.046	0.438	1.275	4.014	.000
	Flamenbaum, 2009[16]	0.763	0.223	0.050	0.325	1.200	3.414	.001
	Pereira, 2010[24]	0.537	0.323	0.104	−0.097	1.170	1.661	.097
	Conrad, 2009[35]	−0.253	0.226	0.051	−0.695	0.189	−1.121	.262
	Shelef, 2015[64]	0.973	0.168	0.028	0.644	1.302	5.795	.000
	Troister, 2015[21]	1.366	0.070	0.005	1.229	1.503	19.537	.000
Random		0.722	0.191	0.037	0.346	1.097	3.770	.000



attempters than in nonattempters, with a large effect size (SMD = 0.72 [95% CI, 0.34 to 1.09], $z = 3.77$, $P < .001$) (Figure 2). The associated funnel plot was graphically asymmetric, and the P value of the Egger regression intercept was not statistically significant ($P = .09$). The Rosenthal fail-safe N value was high (number of missing studies that would bring P value to > .05: 651 studies).

We conducted several subgroup analyses (Supplementary eTable 2). According to the absence or presence of between-group differences for depressive scores, psychological pain level was higher in suicide attempters than in nonattempters (respectively, SMD = 0.32 [95% CI, 0.02 to 0.63], $z = 2.12$, $P = .03$; SMD = 1.46 [95% CI, 1.20 to 1.73], $z = 10.87$, $P < 10^{-2}$) (Supplementary eFigure 1). The SMD differed between the 2 subgroups (Q value = 30.91, $P < 10^{-2}$). According to the study sample (general population vs psychiatric patients), psychological pain levels remained higher in suicide attempters than in nonattempters in the general population with a large effect size (SMD = 0.94 [95% CI, 0.68 to 1.25], $z = 6.69$, $P < 10^{-2}$) but not in psychiatric patient subgroups (SMD = 0.38 [95% CI, −0.19 to 0.97], $z = 1.30$, $P = .19$) (Supplementary eFigure 2). The SMD was not different between the 2 subgroups (Q value = 3.14, $P = .07$). With regard to age (cutoff = 30 years), psychological pain levels remained higher in suicide attempters than in nonattempters for subjects < 30 years, with a large effect size (SMD = 0.95 [95% CI, 0.62 to 1.28], $z = 5.71$, $P < 10^{-2}$) and also for subjects > 30 years (SMD = 0.73 [95% CI, 0.03 to 1.21], $z = 2.04$, $P = .04$) (Supplementary eFigure 3). The SMD was not statistically different between the 2 subgroups (Q value = 0.32, $P = .56$).

Comparison of Psychological Pain in Subjects With and Without Current Suicide Attempts

A meta-analysis of 7 studies[25,30,31,33,35,36,38] including 344 patients with a current suicide attempt and 357 patients without a current suicide attempt was performed. Psychological pain levels were higher in current suicide attempters than in current nonattempters, with a large effect size (SMD = 0.66 [95% CI, 0.21 to 1.14], $z = 3.87$, $P < 10^{-2}$) (Figure 3). The associated funnel plot was graphically asymmetric, and the P value of the Egger regression intercept was not statistically significant ($P = .31$). The Rosenthal fail-safe N value was high (number of missing studies that would bring P value to > .05: 87 studies). No subgroup analyses were performed due to insufficient data.

Moreover, 3 studies[29,30,32] have divided suicide attempters into 2 groups according to the medical consequences of the suicide attempt: 113 medically serious suicide attempters and 183 medically nonserious suicide attempters in total. We thus have conducted supplemental analyses including 9 studies[25,29–33,35,36,38] after having added: (1) 113 medically serious suicide attempters and 118 nonattempters in previous analyses and (2) 183 medically nonserious suicide attempters and 118 nonattempters in previous analyses. In both cases, we have reported higher psychological pain levels in current suicide attempters than in current nonattempters in both analyses (SMD = 0.90, $P < 10^{-2}$ and SMD = 0.70, $P < 10^{-2}$, respectively) (Supplementary eFigures 4 and 5). Furthermore, psychological pain level was higher in suicide attempters than in nonattempters regardless of absence or presence of between-group differences for depressive scores (respectively, SMD = 0.87 [95% CI, 0.10 to 0.22], $z = 2.63$, $P < 10^{-2}$; SMD = 1.00 [95% CI, 0.55 to 1.44], $z = 4.41$, $P < 10^{-2}$; Supplementary eFigure 6; SMD = 0.81 [95% CI, 0.16 to 1.45], $z = 2.47$, $P = .01$; SMD = 0.86 [95% CI, 0.36 to 1.37], $z = 3.36$, $P < 10^{-2}$; Supplementary eFigure 7).

Finally, for these 3 studies,[29,30,32] we performed subgroup analysis to compare level of psychological pain between medically serious suicide attempters and medically nonserious suicide attempters within patients who are

Figure 3. Psychological Pain Levels in Subjects With Versus Without Current Suicide Attempt

Model	Study	Standard Difference in Means	Standard Error	Variance	Lower Limit	Upper Limit	Z Value	P Value
	Levinger, 2015[31]	0.928	0.239	0.057	0.459	1.396	3.882	.000
	Cáceda, 2014[25]	2.096	0.394	0.155	1.324	2.867	5.325	.000
	Nahaliel, 2014[33]	0.925	0.210	0.044	0.512	1.337	4.394	.000
	Gvion, 2014[30]	0.543	0.182	0.033	0.186	0.900	2.979	.003
	Olié, 2010[38]	0.116	0.166	0.028	−0.210	0.442	0.700	.484
	Corona, 2013[36]	−0.504	0.287	0.082	−1.067	0.058	−1.757	.079
	Conrad, 2009[35]	0.810	0.237	0.056	0.347	1.274	3.424	.001
Random		0.663	0.230	0.053	0.212	1.114	2.879	.004

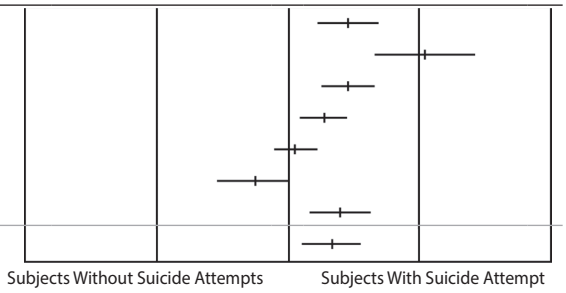
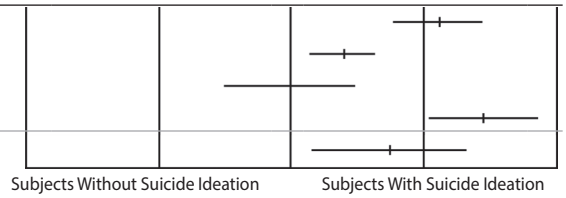


Figure 4. Psychological Pain Levels in Subjects With Versus Without Lifetime History of Suicidal Ideation

Model	Study	Standard Difference in Means	Standard Error	Variance	Lower Limit	Upper Limit	Z Value	P Value
	Cáceda, 2014[25]	2.235	0.348	0.121	1.553	2.918	6.417	.000
	Pereira, 2010[24]	0.802	0.256	0.066	0.300	1.305	3.128	.002
	Conrad, 2009[35]	−0.008	0.507	0.257	−1.002	0.986	−0.016	.987
	Xie, 2014[39]	2.910	0.421	0.177	2.085	3.734	6.914	.000
Random		1.497	0.598	0.357	0.326	2.669	2.505	.012



suicide attempters. Even if psychological pain was higher in medically serious suicide attempters as compared to medically nonserious suicide attempters (SMD = 0.27, $P < 10^{-2}$), the effect size was small (Supplementary eFigure 8).

Comparison of Psychological Pain in Subjects With and Without Lifetime History of Suicidal Ideation

A meta-analysis of 4 studies,[24,25,35,39] including 262 patients with a lifetime history of suicidal ideation and 64 patients without such history, was performed. Psychological pain levels were higher in suicidal ideators than in nonideators, with a large effect size (SMD = 1.49 [95% CI, 0.32 to 2.66], $z = 2.50$, $P = .01$) (Figure 4). The associated funnel plot was graphically asymmetric, and the P value of the Egger regression intercept was not statistically significant ($P = .79$). The Rosenthal fail-safe N value was high (number of missing studies that would bring P value to > .05: 67 studies). No subgroup analyses were performed due to insufficient data.

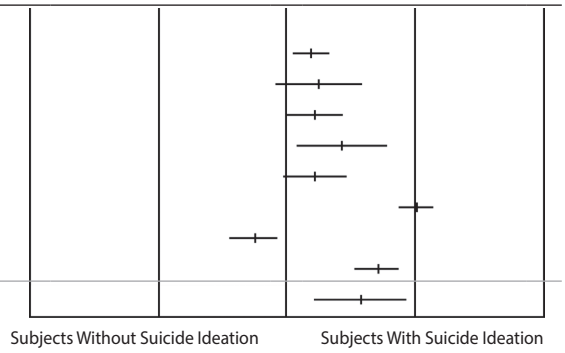
Comparison of Psychological Pain in Subjects With and Without Current Suicidal Ideation

A meta-analysis of 9 studies including 551 subjects with current suicidal ideation and 7,383 subjects without current suicidal ideation was performed.[12,21,22,25,31,35,38,41,67] Psychological pain levels were higher in current suicidal ideators than in current nonideators, with a large effect size (SMD = 1.15 [95% CI, 0.43 to 1.86], $z = 3.14$, $P < 10^{-2}$) (Figure 5). The associated funnel plot was graphically asymmetric, and the P value of the Egger regression intercept was not statistically significant ($P = .71$). The Rosenthal fail-safe N value was high (number of missing studies that would bring P value to > .05: 370 studies).

We conducted subgroup analyses (Supplementary eTable 2). According to the absence or presence of between-group differences for depressive scores, psychological pain level was higher in current suicide ideators than in current nonideators (SMD = 0.40 [95% CI, 0.17 to 0.64], $z = 3.42$, $P = 10^{-2}$; SMD = 2.90 [95% CI, 1.03 to 4.78], $z = 3.03$, $P < 10^{-2}$) (Supplementary eFigure 11). The SMD differed between the 2 subgroups (Q value = 6.71, $P = .01$). According to the study sample (general population vs psychiatric patients), psychological pain level was higher in current suicide ideators than in current nonideators (general population: SMD = 1.32 [95% CI, 0.49 to 2.14], $z = 3.13$, $P < 10^{-2}$; psychiatric patients: SMD = 1.04 [95% CI, 0.19 to 1.88], $z = 2.41$, $P = .01$) (Supplementary eFigure 12). The SMD was not statistically different between the 2 subgroups (Q value = 0.21, $P = .64$). According to age (cutoff = 30 years old), psychological pain level was higher in current suicide ideators than in current nonideators for both subgroups (age < 30 years old: SMD = 1.50 [95% CI, 0.91 to 2.10], $z = 4.94$, $P < 10^{-2}$; age > 30 years old: SMD = 1.32 [95% CI, 0.11 to 2.53], $z = 2.13$, $P = .03$) (Supplementary eFigure 13). The SMD was not statistically different between the 2 subgroups (Q value = 0.07, $P = .78$).

Figure 5. Psychological Pain Levels in Subjects With Versus Without Current Suicidal Ideation

Model	Study	Standard Difference in Means	Standard Error	Variance	Lower Limit	Upper Limit	Z Value	*P* Value
	Cáceda, 2014[25]	6.357	0.759	0.577	4.869	7.846	8.372	.000
	Olié, 2010[38]	0.378	0.147	0.021	0.090	0.665	2.577	.010
	Van Heeringen, 2010[41]	0.507	0.344	0.119	−0.169	1.182	1.471	.141
	Pompifi, 2008[12]	0.439	0.223	0.050	0.002	0.875	1.970	.049
	Levinger, 2015[31]	0.865	0.363	0.132	0.153	1.577	2.380	.017
	Patterson, 2012[22]	0.443	0.253	0.064	−0.054	0.939	1.747	.081
	Troister, 2015[21]	2.028	0.142	0.020	1.750	2.305	14.325	.000
	Conrad, 2009[35]	−0.507	0.189	0.036	−0.878	−0.136	−2.676	.007
	Shelef, 2015[64]	1.423	0.179	0.032	1.072	1.774	7.953	.000
Random		1.150	0.365	0.133	0.434	1.866	3.148	.002



DISCUSSION

Our meta-analysis investigated the relationship between psychological pain and suicidality, ranging from suicidal ideation to suicide attempt. With large effect sizes, psychological pain was higher (1) in both subjects with (vs without) current suicide attempts and subjects with lifetime history of suicide attempts and (2) in both subjects with (vs without) current suicidal ideation and subjects with lifetime history of suicidal ideation. Interestingly, in subgroup analyses, the association between current and lifetime history of suicidality and psychological pain remained significant even in subgroups without between-group differences for depressive scores. It suggests that depression in itself does not explain the association between high levels of psychological pain and suicidal behavior. Indeed, previous studies showed that measures of depression, hopelessness, and psychological pain assess different latent dimensions. For prediction of suicidality, models including 3 factors (depression, hopelessness, and psychological pain) fit better than 1- or 2-factor models excluding psychological pain.[68–70] Thus, factor analysis and discriminant validity of associated factor scores attest to the delineation of depression, hopelessness, and psychological pain as separate constructs.

According to subgroup analyses, psychological pain was associated with both current and lifetime history of suicidality, whatever the subject's age. Interestingly, psychological pain was higher in suicidal versus nonsuicidal subjects within general population samples, suggesting a specific association between suicidality and psychological pain, independent of psychiatric disorders (including depression). Of further interest, Troister and Holden[18] reported that psychological pain was the psychological variable most strongly associated with current suicidality, even more than depression.

Assessment of psychological pain might be an additive dimension that could help correctional officers or primary care physicians screen subjects, including youngsters, at high risk of suicide. In a prospective study focusing on undergraduate students at a high risk of suicide, Troister and Holden[19] reported that only changes in psychological pain could predict changes in suicidal ideation over a 2-year period, even after controlling for depression and hopelessness. Changes in psychological pain levels over time contributed to variance in suicide ideation over time.[19] Nevertheless, further longitudinal studies are required to determine whether assessing psychological pain may be useful to detect suicidal transitions, ie, individuals attempting suicide among those developing suicidal ideation. If our results suggest that psychological pain should be more widely used in daily practice, clinicians might prefer to use easier scales than the Psychache and Orbach and Mikulincer Mental Pain scales. Similarly to how physical pain scales are used in clinical practice in primary care medicine, psychiatrists could use the Likert scale for psychological pain assessment.[38] Indeed, it was shown that high levels of psychological pain assessed by the Likert scale were associated with a history of suicide attempt as well as intensity of current suicidal ideation in depressed patients.[38]

Beyond Shneidman's work placing psychological pain at the core of suicide, psychological pain and suicide have been previously associated in the literature, opening new perspectives for understanding suicidal physiopathology. Psychological pain and suicidal vulnerability might rely on common neuroanatomical pathways based on a potential neural network including prefrontal and cingulate cortices[71–73] involved in emotion regulation and valuation process. Second, suicidal vulnerability and psychological pain may both involve the opioidergic system. Interestingly, a low dose of buprenorphine, a μ opioid partial agonist and κ opioid antagonist, reduced suicidal ideation and psychological pain in suicidal patients.[74]

Consequently, our results offer clinical perspectives for the management of high-risk suicidal individuals. In the future, psychological pain may be a target in suicide prevention. At a pharmacologic level, new add-on treatments such as ketamine at infra-anesthetic dose, initially known to have analgesic effects, or ultra-low dose of sublingual buprenorphine show promise for their antisuicidal

effects.[74,75] At a psychotherapeutic level, innovative interventions also deserve more attention. A pilot study[76] suggested that acceptance and commitment therapy could be useful to reduce suicidal ideation and psychological pain in individuals who attempted suicide within the past year.

Nevertheless, our findings have potential limitations. First, current suicidality was assessed independently from lifetime history. It would have been interesting to have data about history of suicide attempt in suicidal ideators and noncurrent suicidal ideators. Indeed, presence of suicide attempt may modulate the relationship between suicidal ideation and psychological pain. However, for clinical practice, it is important to detect patients engaged in suicidal crisis, regardless of their personal history. Second, populations in the studies included in our meta-analysis were heterogeneous regarding psychopathology. But, the transnosographic dimension of suicidality limits the impact of the heterogeneous diagnoses of our results. Third, we were unable to perform a meta-analysis while controlling for depression due to unavailable individual data. Even though it should be interpreted with caution, we performed a subgroup analysis showing that the relationship between psychological pain and suicidality remained significant in samples with similar levels of depression. However, we cannot formally exclude that depression may be a potential confounder in the observed relationships between psychological pain and suicidality. Future studies should explore this issue. Finally, funnel plots were graphically asymmetric for each outcome and might suggest the presence of a publication bias, in particular due to the selection of articles in English only. However, funnel plot asymmetry is not a proof of bias[77] and can be due to a true heterogeneity. In addition, the *P* value of the Egger regression intercept was not statistically significant for most analyses (even if a lack of statistical power cannot be excluded), and the Rosenthal fail-safe *N* value was high for all analyses.

In conclusion, our major finding is a robust association between psychological pain and suicidality. Higher psychological pain perception may help identify individuals at a high risk of suicidal ideation and action, even among the general population. Besides being highly relevant for clinicians' daily practice, considering psychological pain at the core of suicidality may also help promote the development of new therapeutic strategies for suicide prevention.

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Supplementary Material

Article Title: Psychological Pain in Suicidality: A Meta-Analysis

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List of Supplementary Material for the article

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Supplementary eTable 1.Study characteristics of psychological pain in subjects with suicidal behaviors versus those without.

Studies: author date	Population	Type of Suicidality	Scale assessing Psychological pain	Study sample	Age (years): mean(SD)	Gender (% Male)	Mean (SD) of psychological pain	Scale of depression & scores of depression Mean (SD)	Newcastle Ottawa Scale
Holden 2001[a] (14)	Suicidal subjects: Undergraduates Non suicidal subjects: Undergraduates	Lifetime history of SA	Psychache scale	SA: 30 No SA: 264	NA	NA	SA: 28.0 (8.4) No SA: 22.8 (7.8)	NA	7
Flamenbaum 2007[a] (15)	Suicidal subjects: Undergraduates Non suicidal subjects: Undergraduates	Lifetime history of SA	Psychache scale	SA: 25 No SA: 239	SA: 19.56 (5.27) No SA: 18.08 (NA)	SA: 0 No SA: 26.8	SA: 30.24 (11.52) No SA: 21.98 (9.43)	NA	7
Levi 2008 (29)	Suicidal subjects: Inpatients (who made medically serious suicide attempts) Non suicidal subjects: Healthy Controls	Current SA	OMMP	MSA: 35 NMSA: 67 No SA: 71	NA	NA	MSA: 3.86 (0.80) NMSA: 3.67 (0.72) No SA: 2.74 (0.77)	BDI MSA: 36.11 (14.28) NMSA: 30.50 (13.23) No SA: 5.72 (6.29)	8
Pompili 2008 (12)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Lifetime history of SA Current SI	PPAS scale	SA: 39 No SA: 49 SI: 55 No SI: 33	NA	NA	SA: 6.41 (2.21) No SA: 6.86 (2.44) SI: 7.04 (2.28) No SI: 6.03 (2.34)	NA	7
Flamenbaum[a] 2009 (16)	Suicidal subjects: Undergraduates Non suicidal subjects:	Lifetime history of SA	Psychache scale	SA: 21 No SA: 561	SA: 19.86 (3.84) No SA: 18.28 (NA)	SA: 28.56 No SA: 25.4	SA: 26.48 (10.95) No SA: 20.36 (7.90)	NA	6

	Undergraduates								
Conrad[a] 2009 (35)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Lifetime history of SA Lifetime history of SI Current SA Current SI	OMMP	Lifetime history of SA: 94 No lifetime history of SA: 25 Lifetime history of SI: 135 No lifetime history of SI: 4 Current SA: 22 No current SA: 121 Current SI: 107 No current SI: 39	Lifetime history of SA: 34.17 (11.22) No lifetime history of SA: 37.84 (11.92) Lifetime history of SI: 35.24 (11.76) No lifetime history of SI: 34.25 (17.35) Current SA: 33.86 (11.24) No current SA: 35.93 (12.21) Current SI: 36.07 (11.34) No current SI: 33.95 (13.56)	Lifetime history of SA: 30.9 No lifetime history of SA: 24.0 Lifetime history of SI: 30.4 No lifetime history of SI: 25.0 Current SA: 31.8 No recent SA: 29.8 Current SI: 21.7 No current SI:41.0	Lifetime history of SA: 112.73 (41.69) No lifetime history of SA: 122.60 (26.34) Lifetime history of SI: 115.37 (37.85) No lifetime history of SI: 115.67 (30.02) Current SA: 144.31 (43.15) No current SA: 113.79 (36.61) Current SI: 113.02 (38.44) No current SI: 132.31 (36.97)	NA	6
Olié[a] 2010 (38)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Current SA Lifetime history of SA Current SI	Visual Analogic Scale	Current SA: 87 No current SA: 62 Lifetime history of SA: 148 No lifetime history of SA: 62	Current SA: 40.07 (12.42) No current SA: 40.18 (13.52) Lifetime history of SA: 39.29 (12.96) No lifetime history of SA: 40.18 (13.52)	Current SA: 33.3 No current SA: 27.4 Lifetime history of SA: 43.6 No lifetime history of SA: 37.7	Current SA: 7.08 (2.75) No current SA: 6.79 (2.07) Lifetime history of SA: 7.08 (2.55) No lifetime history of SA: 6.79 (2.07)	BDI Current SA: 21.29 (6.52) No Current SA: 19.63 (6.12) Lifetime history of SA: 21.58 (6.70) No lifetime history of SA: 19.63 (6.12) Current SI: 22.84 (5.71)	6

				Current SI: 138 No current SI: 72	Current SI: 38.14 (13.16) No current SI: 42.25 (12.65)	Current SI: 33.33 No current SI: 22.22	Current SI: 7.30 (2.32) No current SI: 6.40 (2.50)	No current SI: 17.15 (6.64)	
Van Heeringen[a] 2010 (41)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Current SI	OMMP scale	SI :13 No SI : 26	NA	NA	SI : 145.8 (23.4) No SI: 129.7 (35.1)	BDI SI: 33.1 (11.6) No SI: 27.3 (12.9)	7
Patterson[a] 2012 (22)	Suicidal subjects: Homeless men Non suicidal subjects: Homeless men	Lifetime history of SA Current SI	Psychache scale	SA: 23 No SA: 74 SI: 76 No SI: 20	SA: 44.65 (8.87) No SA: 47.18 (12.77) SI: 48.41 (11.60) No SI: 39.90 (11.45)	SA: 100 No SA: 100 SI: 100 No SI: 100	SA: 39.34 (13.64) No SA: 22.22 (10.96) SI: 27.65 (14.64) No SI: 21.65 (7.94)	BDI SA: 23.59 (8.63) No SA: 11.94 (9.27) SI: 15.79 (10.36) No SI: 10.34 (9.31)	6
Pereira[a] 2010 (24)	Suicidal subjects: Incarcerated offenders and undergraduates Non suicidal subjects: Incarcerated offenders and undergraduates	Lifetime history of SI Lifetime history of SA	Psychache scale	Lifetime history of SI: 55 No lifetime history of SI: 23 Lifetime history of SA: 29 No lifetime history of SA: 15	Lifetime history of SI: 31.16 (14.71) No lifetime history of SI: 21.17 (5.51) Lifetime history of SA: 35.72 (17.03) No lifetime history of SA: 20.93 (5.66)	Lifetime history of SI: 69.09 No lifetime history of SI: 69.09 Lifetime history of SA: 86.21 No lifetime history of SA: 69.09	Lifetime history of SI: 30.19 (11.13) No lifetime history of SI: 21.95 (7.77) Lifetime history of SA: 33.23 (12.95) No lifetime history of SA: 26.93 (8.84)	DHS Depression SI: 7.56 (4.24) No SI: 4.78 (3.59) SA: 8.59 (4.22) No SA: 5.93 (4.01)	6
Corona[a] 2013 (36)	Suicidal subjects: Outpatients Non suicidal subjects: Outpatients	Current SA	Likert scale for SSF psychological pain	SA: 31 No SA: 21	NA	NA	SA: 3.74 (0.70) No SA: 4.16 (1.00)	NA	5

Caceda[a] 2014 (25)	Suicidal subjects: Inpatients and outpatients Non suicidal subjects: Inpatients and outpatients	Current SA Current SI Lifetime history of SA Lifetime history of SI	Psychache scale	Current SA: 20 Nocurrent SA: 20 Current SI: 22 No Current SI: 20 Lifetime history of SA: 45 No lifetime history of SA: 17 Lifetime history of SI: 45 No lifetime history of SI: 17	Current SA: 36.4 (3.8) No current SA: 46.2 (2.5) Current SI: 43.1 (2.7) No currentSI : 46.2 (2.5) Lifetime history of SA: 37.72 (13.82) No lifetime history of SA: 35.10 (15.87) Lifetime history of SI: 38.33 (15.06) No lifetime history of SI: 31.53 (15.30)	Current SA: 40 No current SA: 35 current SI: 50 No currentSI: 35 Lifetime history of SA: 31.1 No lifetime history of SA: 70.5 Lifetime history of SI: 46.7 No lifetime history of SI: 47.0	Current SA: 43.4 (2.9) No currentSA: 37.0 (3.2) Current SI: 54.3 (2.2) No current SI: 37.0 (3.2) Lifetime history of SA: 52.24 (11.90) No lifetime history of SA: 26.23 (16.74) Lifetime history of SI: 47.12 (15.25) No lifetime history of SI: 16.31 (8.54)	BDI Current SA: 29.1 (2.6) No currentSA: 25.5 (2.4) CurrentSI: 36.2 (2.6) No currentSI: 25.5 (2.4) Lifetime history of SA: 36.34 (10.66) No lifetime history of SA 12.13 (13.60) Lifetime history of SI: 31.24 (14.01) No lifetime history of SI: 4.35 (6.45)	7
Li 2014 (40)	Suicidal subjects: Outpatients Non suicidal subjects: Outpatients	Lifetime history of SA	Psychache scale	SA: 28 No SA: 83	SA: 28.93 (12.37) No SA: 33.99 (12.63)	SA: 28.57 No SA: 39.76	SA: 44.61 (11.56) No SA: 38.46 (11.62)	BDI: SA: 28.93 (11.51) No SA: 24.41 (11.00)	7

Smadar 2014 (33)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Current SA	Mental Pain Scale	SA: 50 No SA: 50	SA: 43.26 (14.5) No SA: 43.86 (15.4)	SA: 30 No SA: 30	SA: 3.39 (0.71) No SA: 2.71 (0.76)	BDI SA: 1.58 (0.65) No SA: 0.98 (0.62)	7
Levi-Belz 2014 (32)	Suicidal subjects: Inpatients (who made medically serious suicide attempts) Non suicidal subjects: Inpatients	Current SA	Mental Pain Scale	MSA: 78 MNSA: 116 No SA: 47	SA:38.5 (14.2) MNSA:38.5 (13.9) No SA: 40.9 (14.0)	SA: 56.4 MNSA: 44.0 No SA: 29.8	MSA: 3.86 (0.75) MNSA: 3.65 (0.70) No SA: 3.32 (0.86)	BDI MSA: 34.9 (13.12) MNSA:30.9 (13.1) No SA: 21.9 (13.9)	7
Gvion[a] 2014 (30)	Suicidal subjects: Inpatients (who made medically serious suicide attempts) Non suicidal subjects: Inpatients	Current SA	OMMP	MSA: 43 MNSA: 49 SA (MSA+MNSA): 92 No SA: 47	MSA: 37.37 (13.31) MNSA: 40.31 (13.76) No SA: 40.96 (14.07)	MSA: 60.5 MNSA: 69.4 SA (MSA+MNSA): 65.2 No SA: 70.2	MSA: 3.83 (0.74) MNSA: 3.65 (0.70) SA (MSA+MNSA): 3.74 (0.72) No SA: 3.32 (0.87)	BDI MSA: 1.62 (0.59) MNSA: 1.50 (0.63) SA (MSA+MNSA): 1.56 (0.61) No SA: 1.04 (0.67)	8
Xie 2014 (39)	Suicidal subjects: Outpatients (high BSS-C and BSS-W scores) Non suicidal subjects: Healthy Controls	Lifetime history of SI	Psychache Scale	SI: 27 No SI: 20	SI: 29.81 (10.54) No SI: 30.00 (11.12)	SI: 29.6 No SI: 40.0	SI: 46.11 (10.73) No SI: 20.60 (4.95)	BDI: SI: 30.48 (10.49) No SI: 5.02 (2.47)	7
Troister[a] 2015 (21)	Suicidal subjects: Undergraduates Non suicidal subjects: Undergraduates	Lifetime history of SA	Psychache scale	SA: 216 No SA: 7306 SI: 51	SA: 18.56 (2.17) No SA: 18.22 (1.93)	SA: 16.9 No SA: 25.1 SI: 38.0	SA: 31.00 (12.64) No SA: 20.02 (7.86)	BDI SA: 15.48 (11.67) No SA: 7.81 (6.86)	6

		Current SI		No SI: 7049	SI: 18.14 (0.79) No SI: 18.21 (1.72)	No SI: 24.77	SI: 36.62 (14.00) No SI: 20.22 (8.03)	SI: 27.97 (12.88) No SI: 7.87 (6.88)	
Levinger[a] 2015 (31)	Suicidal subjects: Inpatients Non suicidal subjects: Inpatients	Current SA Current SI	OMMP	SA: 42 No SA: 36 SI: 31 No SI: 11	SA: 18.6 (3.3) No SA: 21.08 (2.73) SI: 17.94 (2.94) No SI: 20.45 (3.67)	SA: 45.2 No SA: 58.3 SI: 41.9 No SI: 54.5	SA: 3.13 (0.77) No SA: 2.42 (0.76) SI: 3.31 (0.80) No SI: 2.68 (0.45)	BDI SA: 29.79 (11.09) No SA: 15.50 (10.78) SI: 34.26 (10.31) No SI: 22.88 (11.48)	6
Shelef[a] 2015 (65)	Suicidal subjects: Soldiers Non suicidal subjects: Psychologically treated and healthy soldiers	Lifetime history of SA Current SI	OMMP	SA: 62 No SA: 108 SI: 58 No SI: 113	SA: 19.42 (0.90) No SA: 19.88 (1.25) SI: 19.26 (0.83) No SI: 19.94 (1.23)	SA: 59.7 No SA: 61.1 SI: 60 No SI: 61.8	SA: 140.56 (42.31) No SA: 101.58 (38.75) SI: 150.10 (39.18) No SI: 98.05 (35.18)	NA	7

SA=Suicide Attempt; SI = Suicide Ideation; HC = Healthy Controls; BDI : Beck Depression Inventory; BSS= Beck Scale for Suicide Ideation; MSA= Medically Serious Suicide Attempt, MNSA= Medically Non Serious Suicide Attempt; NA=NotAvailable; DHS = Depression Hopelessness Suicide Screening Form; OMMP= Orbach and Milkuncer Mental Pain; PPAS = Psychological Pain Assessment Scale; SSF= Suicide Status Form; SD= Standard Deviation

[a] Studies for which corresponding author provided data not shown in the published paper.

Supplementary eTable 2. Effect sizes for the contrasts between suicidal vs non suicidal subjects for the whole sample and subgroup analyses

	Subjects with vs. without lifetime history of SA				Subjects with vs. without current SA				Subjects with vs. without lifetime history of SI				Subjects with vs. without current SI			
Whole sample	Studies included	n	SMD (95% CI)	Z^a	Studies included	n	SMD (95% CI)	Z^a	Studies included	n	SMD (95% CI)	Z^a	Studies included	n	SMD (95% CI)	Z^a
	12, 14-16, 21, 22, 24, 25, 35, 38, 40, 65	760 vs.8803	0,72 (0,34 to 1,09)	3.77***	25, 30, 31, 33, 35, 36, 38	344 vs. 357	0,66 (0,21 to 1,11)	2.87**	24,25, 35,39	162 vs. 64	0,49 (0,32 to 2,66)	2.50*	12,21,22, 25,31,35, 38,41,65	551 vs. 7383	1,15 (0,43 to 1,86)	3.14***
Subgroup analysis	Studies included	n	SMD (95% CI)	Z^a	Studies included	n	SMD (95% CD)	Z^a	Studies included	n	SMD (95% CD)	Z^a	Studies included	n	SMD (95% CD)	Z^a
Difference in depressive scores																
No	24,38,40	205 vs. 160	0,32 (0,02 to 0,63)	2,12*	NA	NA	NA	NA	NA	NA	NA	22,38,41	227 vs. 118	0,40 (0,17 to 0,64)	3.42**	
Yes	21,22,25	284 vs. 7397	1,46 (1,20 to 1,73)	10.87***	NA	NA	NA	NA	NA	NA	NA	21,25,31	104 vs. 7080	2,90 (1,03 to 4,78)	3.03**	
Study population																
General	14-16,21, 22,24,65	278 vs. 8567	0,97 (0,68 to 1,25)	6.69***	NA	NA	NA	NA	NA	NA	NA	21,22,65	185 vs.7182	1,32 (0,49 to 2,14)	3.13**	
Psychiatric	12,25,35, 38,40	354 vs. 236	0,38 (-0,19 to 0,97)	1,30	NA	NA	NA	NA	NA	NA	NA	12,25,31, 35,38,41	366 vs. 201	1,04 (0,19 to 1,88)	2.41*	
Age (years)																
< 30	15,16,21, 24,65	353 vs. 8229	0,95 (0,62 to 1,28)	5.71***	NA	NA	NA	NA	NA	NA	NA	21,31,65	140 vs. 7173	1,50 (0,91 to 2,10)	4.94***	

≥ 30	22,25,35, 38,40	338 vs. 261	0,73 (0,03 to 1,43)	2,04*	NA	NA	NA	NA	NA	NA	NA	22,25, 35,38	343 vs 151	1,32 (0,11 to 2,53)	2.13*

[a] Test for the significance of the effect size.
* p<0.05, ** p<0.01, *** p<0.001
NA= Not Available; SA=Suicide Attempt; SI = Suicide Ideation; SMD (95% CI)= Standardized Mean Difference (95% Confidence Interval)

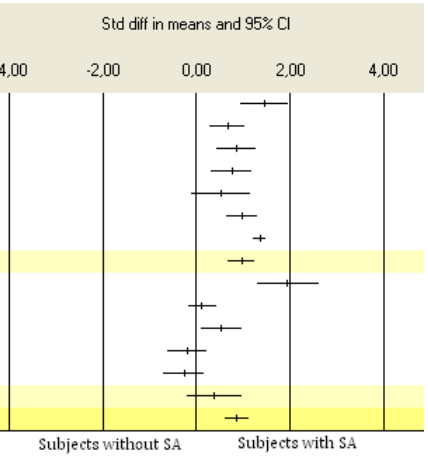
Supplementary eFigure 1. Sub-group analyses: comparison of psychological pain in subjects with and without lifetime history of suicide attempt, according to between-group difference on depressive scores

Model	Group by Difference in depressive scores between groups: no=1; yes=2	Study name	Statistics for each study							Std diff in means and 95% CI
			Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-4,00 -2,00 0,00 2,00 4,00
	1,00	Olié 2010 (38)	0,120	0,151	0,023	-0,177	0,417	0,792	0,428	
	1,00	Li 2014 (40)	0,530	0,221	0,049	0,096	0,964	2,393	0,017	
	1,00	Pereira 2010 (24)	0,537	0,323	0,104	-0,097	1,170	1,661	0,097	
Random	1,00		0,328	0,154	0,024	0,026	0,630	2,128	0,033	
	2,00	Caceda 2014 (25)	1,946	0,334	0,112	1,292	2,601	5,826	0,000	
	2,00	Patterson 2012 (22)	1,471	0,261	0,068	0,960	1,983	5,636	0,000	
	2,00	Troister 2015 (21)	1,366	0,070	0,005	1,229	1,503	19,537	0,000	
Random	2,00		1,466	0,135	0,018	1,202	1,730	10,876	0,000	
Random	Overall		0,972	0,101	0,010	0,774	1,171	9,587	0,000	

Subjects without SA Subjects with SA

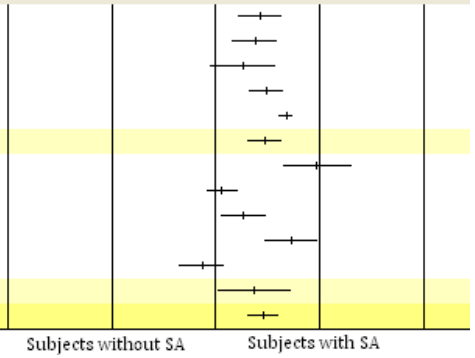
Supplementary eFigure 2. Sub-group analyses: comparison of psychological pain in subjects with and without lifetime history of suicide attempt, according to the study sample (general population or psychiatric patients)

Model	Group by Study sample: general population=1; psychiatric patients=2	Study name	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Patterson 2012 (22)	1,471	0,261	0,068	0,960	1,983	5,636	0,000
	1,00	Holden 2001 (14)	0,661	0,195	0,038	0,280	1,043	3,399	0,001
	1,00	Flamenbaum 2007 (15)	0,857	0,213	0,046	0,438	1,275	4,014	0,000
	1,00	Flamenbaum 2009 (16)	0,763	0,223	0,050	0,325	1,200	3,414	0,001
	1,00	Pereira 2010 (24)	0,537	0,323	0,104	-0,097	1,170	1,661	0,097
	1,00	Shelef 2015 (65)	0,973	0,168	0,028	0,644	1,302	5,795	0,000
	1,00	Troister 2015 (21)	1,366	0,070	0,005	1,229	1,503	19,537	0,000
Random	1,00		0,974	0,145	0,021	0,689	1,259	6,699	0,000
	2,00	Caceda 2014 (25)	1,946	0,334	0,112	1,292	2,601	5,826	0,000
	2,00	Olié 2010 (38)	0,120	0,151	0,023	-0,177	0,417	0,792	0,428
	2,00	Li 2014 (40)	0,530	0,221	0,049	0,096	0,964	2,393	0,017
	2,00	Pompili 2008 (12)	-0,192	0,215	0,046	-0,614	0,229	-0,894	0,371
	2,00	Conrad 2009 (35)	-0,253	0,226	0,051	-0,695	0,189	-1,121	0,262
Random	2,00		0,387	0,297	0,088	-0,195	0,970	1,305	0,192
Random	Overall		0,861	0,131	0,017	0,605	1,117	6,590	0,000



Supplementary eFigure 3. Sub-group analyses: comparison of psychological pain in subjects with and without lifetime history of suicide attempt, according to mean subjects' age

Model	Group by Age: <30 years=1; > 30 years = 2	Study name	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Flamenbaum 2007 (15)	0,857	0,213	0,046	0,438	1,275	4,014	0,000
	1,00	Flamenbaum 2009 (16)	0,763	0,223	0,050	0,325	1,200	3,414	0,001
	1,00	Pereira 2010 (24)	0,537	0,323	0,104	-0,097	1,170	1,661	0,097
	1,00	Shelef 2015 (65)	0,973	0,168	0,028	0,644	1,302	5,795	0,000
	1,00	Troister 2015 (21)	1,366	0,070	0,005	1,229	1,503	19,537	0,000
Random	1,00		0,956	0,167	0,028	0,628	1,284	5,714	0,000
	2,00	Caceda 2014 (25)	1,946	0,334	0,112	1,292	2,601	5,826	0,000
	2,00	Olié 2010 (38)	0,120	0,151	0,023	-0,177	0,417	0,792	0,428
	2,00	Li 2014 (40)	0,530	0,221	0,049	0,096	0,964	2,393	0,017
	2,00	Patterson 2012 (22)	1,471	0,261	0,068	0,960	1,983	5,636	0,000
	2,00	Conrad 2009 (35)	-0,253	0,226	0,051	-0,695	0,189	-1,121	0,262
Random	2,00		0,732	0,357	0,128	0,032	1,432	2,049	0,041
Random	Overall		0,916	0,152	0,023	0,619	1,213	6,043	0,000



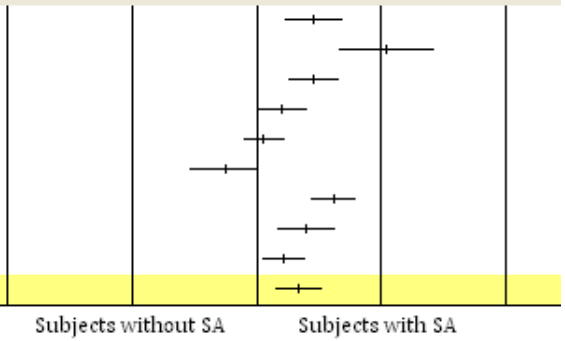
Supplementary eFigure 4. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide attempt, including MSA as SA group for studies #29, #30, #32

Model	Study name	Statistics for each study							Std diff in means and 95% CI
		Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-4,00 -2,00 0,00 2,00 4,00
	Levinger 2015 (31)	0,928	0,239	0,057	0,459	1,396	3,882	0,000	
	Caceda 2014 (25)	2,096	0,394	0,155	1,324	2,867	5,325	0,000	
	Smadar 2014 (33)	0,925	0,210	0,044	0,512	1,337	4,394	0,000	
	Gvion 2014 (30)	0,629	0,216	0,047	0,205	1,053	2,911	0,004	
	Olié 2010 (38)	0,116	0,166	0,028	-0,210	0,442	0,700	0,484	
	Corona 2013 (36)	-0,504	0,287	0,082	-1,067	0,058	-1,757	0,079	
	Levi 2008 (29)	1,436	0,229	0,052	0,987	1,885	6,274	0,000	
	Conrad 2009 (35)	0,810	0,237	0,056	0,347	1,274	3,424	0,001	
	Levi-Belz 2014 (32)	0,681	0,190	0,036	0,309	1,053	3,592	0,000	
Random		0,762	0,199	0,040	0,372	1,153	3,823	0,000	

Subjects without SA Subjects with SA

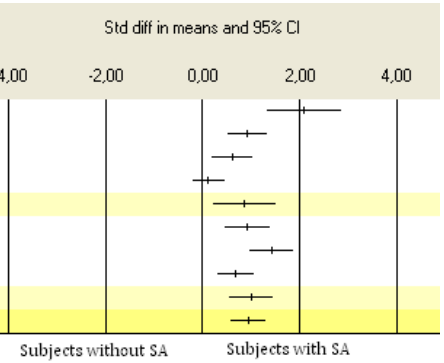
Supplementary eFigure 5. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide attempt, including MNSA as SA group for studies #29, #30, #32

Model	Study name	Statistics for each study						
		Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Levinger 2015 (31)	0,928	0,239	0,057	0,459	1,396	3,882	0,000
	Caceda 2014 (25)	2,096	0,394	0,155	1,324	2,867	5,325	0,000
	Smadar 2014 (33)	0,925	0,210	0,044	0,512	1,337	4,394	0,000
	Gvion 2014 (30)	0,419	0,206	0,043	0,014	0,823	2,030	0,042
	Olié 2010 (38)	0,116	0,166	0,028	-0,210	0,442	0,700	0,484
	Corona 2013 (36)	-0,504	0,287	0,082	-1,067	0,058	-1,757	0,079
	Levi 2008 (29)	1,246	0,186	0,035	0,882	1,611	6,697	0,000
	Conrad 2009 (35)	0,810	0,237	0,056	0,347	1,274	3,424	0,001
	Levi-Belz 2014 (32)	0,440	0,175	0,030	0,098	0,783	2,522	0,012
Random		0,689	0,193	0,037	0,311	1,068	3,568	0,000



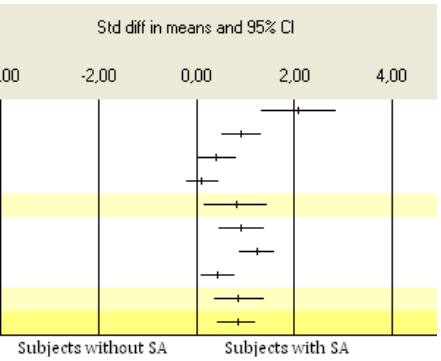
Supplementary eFigure 6. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide attempt (including MSA as SA group for studies #29, #30, #32), according to between-group difference on depressive scores

Model	Group by Difference in depressive scores between groups: no=1; yes=2	Study name	Statistics for each study						
			Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Caceda 2014 (25)	2,096	0,394	0,155	1,324	2,867	5,325	0,000
	1,00	Smadar 2014 (33)	0,925	0,210	0,044	0,512	1,337	4,394	0,000
	1,00	Gvion 2014 (30)	0,629	0,216	0,047	0,205	1,053	2,911	0,004
	1,00	Olié 2010 (38)	0,116	0,166	0,028	-0,210	0,442	0,700	0,484
Random	1,00		0,870	0,330	0,109	0,223	1,517	2,635	0,008
	2,00	Levinger 2015 (31)	0,928	0,239	0,057	0,459	1,396	3,882	0,000
	2,00	Levi 2008 (29)	1,436	0,229	0,052	0,987	1,885	6,274	0,000
	2,00	Levi-Belz 2014 (32)	0,681	0,190	0,036	0,309	1,053	3,592	0,000
Random	2,00		1,003	0,227	0,052	0,558	1,449	4,412	0,000
Random	Overall		0,960	0,187	0,035	0,593	1,327	5,128	0,000



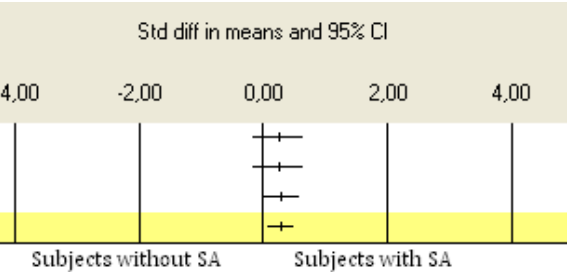
Supplementary eFigure 7. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide attempt (including MNSA as SA group for studies #29, #30, #32), according to between-group difference on depressive scores

Model	Group by Difference in depressive scores between groups: no=1; yes=2	Study name	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Caceda 2014 (25)	2,096	0,394	0,155	1,324	2,867	5,325	0,000
	1,00	Smadar 2014 (33)	0,925	0,210	0,044	0,512	1,337	4,394	0,000
	1,00	Gvion 2014 (30)	0,419	0,206	0,043	0,014	0,823	2,030	0,042
	1,00	Olié 2010 (38)	0,116	0,166	0,028	-0,210	0,442	0,700	0,484
Random	1,00		0,814	0,329	0,108	0,169	1,459	2,474	0,013
	2,00	Levinger 2015 (31)	0,928	0,239	0,057	0,459	1,396	3,882	0,000
	2,00	Levi 2008 (29)	1,246	0,186	0,035	0,882	1,611	6,697	0,000
	2,00	Levi-Belz 2014 (32)	0,440	0,175	0,030	0,098	0,783	2,522	0,012
Random	2,00		0,866	0,258	0,066	0,361	1,371	3,363	0,001
Random	Overall		0,846	0,203	0,041	0,449	1,244	4,173	0,000



Supplementary eFigure 8. Sub-group analyses for studies #29, #30, #32: comparison of psychological pain in subjects with MSA and MNSA

Model	Study name	Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Gvion 2014 (30)	0,250	0,210	0,044	-0,161	0,662	1,194	0,233
	Levi 2008 (29)	0,254	0,209	0,044	-0,156	0,664	1,213	0,225
	Levi-Belz 2014 (32)	0,291	0,147	0,022	0,003	0,580	1,980	0,048
Random		0,272	0,104	0,011	0,067	0,477	2,604	0,009



Supplementary eFigure 9. Sub-group analyses for studies #29, #30, #32: comparison of psychological pain in subjects with MSA and without suicide attempt

Model	Study name	Statistics for each study							Std diff in means and 95% CI
		Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-4,00 -2,00 0,00 2,00 4,00
	Gvion 2014 (30)	0,629	0,216	0,047	0,205	1,053	2,911	0,004	
	Levi 2008 (29)	1,436	0,229	0,052	0,987	1,885	6,274	0,000	
	Levi-Belz 2014 (32)	0,681	0,190	0,036	0,309	1,053	3,592	0,000	
Random		0,906	0,249	0,062	0,418	1,394	3,637	0,000	

Subjects without SA Subjects with SA

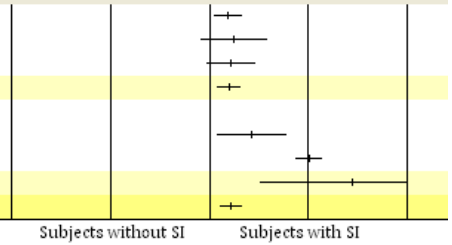
Supplementary eFigure 10. Sub-group analyses for studies #29, #30, #32: comparison of psychological pain in subjects with MNSA and without suicide attempt

Model	Study name	Statistics for each study							Std diff in means and 95% CI
		Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-4,00 -2,00 0,00 2,00 4,00
	Gvion 2014 (30)	0,419	0,206	0,043	0,014	0,823	2,030	0,042	
	Levi 2008 (29)	1,246	0,186	0,035	0,882	1,611	6,697	0,000	
	Levi-Belz 2014 (32)	0,440	0,175	0,030	0,098	0,783	2,522	0,012	
Random		0,704	0,274	0,075	0,166	1,241	2,565	0,010	

Subjects without SA Subjects with SA

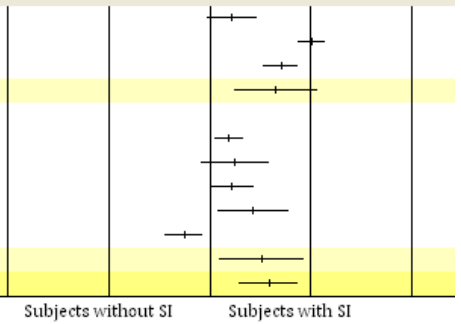
Supplementary eFigure 11. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide ideation, according to between-group difference on depressive scores

Model	Group by Difference in depressive scores between groups: no=1; yes=2	Study name	Statistics for each study						
			Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Olié 2010 (38)	0,378	0,147	0,021	0,090	0,665	2,577	0,010
	1,00	Van Heeringen 2010 (41)	0,507	0,344	0,119	-0,169	1,182	1,471	0,141
	1,00	Patterson 2012 (22)	0,443	0,253	0,064	-0,054	0,939	1,747	0,081
Random	1,00		0,407	0,119	0,014	0,174	0,641	3,423	0,001
	2,00	Caceda 2014 (25)	6,357	0,759	0,577	4,869	7,846	8,372	0,000
	2,00	Levinger 2015 (31)	0,865	0,363	0,132	0,153	1,577	2,380	0,017
	2,00	Troister 2015 (21)	2,028	0,142	0,020	1,750	2,305	14,325	0,000
Random	2,00		2,906	0,957	0,916	1,030	4,781	3,036	0,002
Random	Overall		0,445	0,118	0,014	0,214	0,677	3,771	0,000



Supplementary eFigure 12. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide ideation, according to the study sample (general population or psychiatric patients)

Model	Group by Study sample: general population=1; psychiatric patients=2	Study name	Statistics for each study						
			Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	1,00	Patterson 2012 (22)	0,443	0,253	0,064	-0,054	0,939	1,747	0,081
	1,00	Troister 2015 (21)	2,028	0,142	0,020	1,750	2,305	14,325	0,000
	1,00	Shelef 2015 (65)	1,423	0,179	0,032	1,072	1,774	7,953	0,000
Random	1,00		1,320	0,422	0,178	0,493	2,147	3,130	0,002
	2,00	Caceda 2014 (25)	6,357	0,759	0,577	4,869	7,846	8,372	0,000
	2,00	Olié 2010 (38)	0,378	0,147	0,021	0,090	0,665	2,577	0,010
	2,00	Van Heeringen 2010 (41)	0,507	0,344	0,119	-0,169	1,182	1,471	0,141
	2,00	Pompili 2008 (12)	0,439	0,223	0,050	0,002	0,875	1,970	0,049
	2,00	Levinger 2015 (31)	0,865	0,363	0,132	0,153	1,577	2,380	0,017
	2,00	Conrad 2009 (35)	-0,507	0,189	0,036	-0,878	-0,136	-2,676	0,007
Random	2,00		1,042	0,431	0,186	0,197	1,888	2,416	0,016
Random	Overall		1,184	0,302	0,091	0,593	1,775	3,927	0,000



Supplementary eFigure 13. Sub-group analyses: comparison of psychological pain in subjects with and without current suicide ideation, according to mean subjects' age

Model	Group by Age: <30 years =1; >30 years =2	Study name	Statistics for each study							Std diff in means and 95% CI
			Std diff in means	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	-4,00 -2,00 0,00 2,00 4,00
	1,00	Levinger 2015 (31)	0,865	0,363	0,132	0,153	1,577	2,380	0,017	
	1,00	Troister 2015 (21)	2,028	0,142	0,020	1,750	2,305	14,325	0,000	
	1,00	Shelef 2015 (65)	1,423	0,179	0,032	1,072	1,774	7,953	0,000	
Random	1,00		1,507	0,305	0,093	0,910	2,104	4,947	0,000	
	2,00	Caceda 2014 (25)	6,357	0,759	0,577	4,869	7,846	8,372	0,000	
	2,00	Olié 2010 (38)	0,378	0,147	0,021	0,090	0,665	2,577	0,010	
	2,00	Patterson 2012 (22)	0,443	0,253	0,064	-0,054	0,939	1,747	0,081	
	2,00	Conrad 2009 (35)	-0,507	0,189	0,036	-0,878	-0,136	-2,676	0,007	
Random	2,00		1,323	0,619	0,383	0,110	2,535	2,138	0,032	
Random	Overall		1,471	0,273	0,075	0,935	2,007	5,383	0,000	

Subjects without SI Subjects with SI