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The relationship between Korean university students' suicidal ideation and risk factors: a meta-analysis

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ABSTRACT

This study examines risk factors for university students' suicidal ideation based on a meta-analysis of research published in South Korea from 2004 to 2019. Risk factors included depression, life stress, parents' critical communication, and job stress. Publication bias and study-specific moderator variables were also examined. Depression had the largest effect size, followed by life stress, parents' critical communication, and job stress. Meta-regression analysis showed differences in the effect sizes for depression, parents' critical communication, and job stress according to publication year. The probability of publication bias was low. These findings can help to develop effective suicidal ideation prevention programs for university students. In particular, counselling centres should help intensively prevent and manage depression among university students. Furthermore, mental health services, such as education and counselling programs that address suicidal ideation, must be easily accessible by integrating the students' homes, schools, and communities.

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University student; suicidal ideation; suicidal thought; risk factors; meta- analysis

Introduction

Suicide rate has recently been increasing in South Korea. Korea National Statistical Office (2019) reports that more than 13,000 South Koreans commit suicide each year, the equivalent of approximately 36 people per day, and that South Korea's suicide rate is more than twice the average for OECD countries. In particular, suicide is emerging as a new and serious social problem among young Koreans. The suicide rate among Korean university students has increased by 60% over the past six years, and the number of university students who experience suicidal ideation is also increasing (Kim & Cha, 2018).

Currently, university students in South Korea suffer from job stress due to low employment rate and from economic stress due to economic polarization. They are also subject to interpersonal and academic stress (Jo et al., 2011). This leads many Korean university students to experience negative emotions such as anxiety, depression, and frustration. Persistent negative emotions may increase the likelihood of increasing lethargy, reduced enjoyment of life, and the development of suicidal ideation (Cukrowicz et al., 2011; Schwartz, 2011).

Suicidal ideation is a precursor to suicide and includes thinking about or actually planning one's death. Research on suicidal ideation in university students has continued to accumulate until the present day, and most previous studies have verified risk factors that increase suicidal ideation and protective factors that reduce it. However, it is difficult to assess the effectiveness of these factors because previous studies have differed in terms of measurement tool, study year, sample size, and so

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on. Therefore, finding effective ways to reduce suicidal ideation among Korean university students requires an integrated study to compare the results of previous research and synthesize the risk factors of suicidal ideation through meta-analysis.

South Korea experienced a serious national crisis in 1997 when many companies went bankrupt and unemployment and divorce rates rose. Many Koreans began to experience psychological problems at this time. In particular, low employment rates and rising unemployment caused anxiety and depression among many university students, and suicide rates increased (Kelliher Rabon et al., 2018). In the early 2000s, to reduce suicide among Korean university students, some researchers began studying the risk factors of suicidal ideation. Since then, psychological problems experienced by university students have continued to receive attention as serious social issue, despite South Korea's resolution of the economic crisis and growth into an economic power ranking 11th in global GDP (Kang & Na, 2013). As South Korea entered 2010, however, the nation's economic growth began to slow, and employment emerged as a national problem once again, creating an excessively competitive employment environment and leading to problems such as lethargy and depression among university students (Garlow et al., 2008). Whereas suicidal ideation increased in the early 2000s because university students experienced frustration and depression due to the financial crisis, in 2010, an era of poverty in the midst of plenty, suicidal ideation increased due to students' failure to overcome the excessive competition for employment. Thus, Korean university students have experienced suicidal ideation as a result of various differing causes, dependent on the state of the country and their social and economic circumstances. Many studies conducted since 2010 have explored ways to reduce suicidal ideation among Korean university students, and the topic remains just as active today, demonstrating that the problem remains unsolved.

Two research questions were established to pursue the study's research objectives: 1) what are the average effect sizes of the variables (individual, family, and school) that affect Korean university students' suicidal ideation?; and 2) do publication type, measurement tool, sample size, and publication year affect the effect sizes of the research results?

Literature review

Factors affecting suicidal ideation in university students

The variables that affect suicidal ideation in Korean university students can be distinguished into individual, family, and school factors, and these factors work in combination (Lockman & Servaty-Seib, 2016). Therefore, diverse factors must be considered to understand the phenomenon of suicidal ideation. Furthermore, factors that affect suicidal ideation can be either risk factors, which increase the risk of suicide, or protective factors, which reduce the risk. This study examines ways to reduce suicidal ideation among Korean university students by analysing risk factors. Based on previous studies of Korean university students, the major individual risk factors include depression, stress, impulsiveness, and low self-esteem; the major family risk factors include critical communication by parents, family discord, and childhood abuse by parents, and the major school factors include employment stress and interpersonal relationships at university (Hong et al., 2016; Hong & Park, 2015; Jeong et al., 2015).

Depression is one of the most powerful factors affecting suicidal ideation according to many prior studies (Chen et al., 2017; Pace & Zappulla, 2010; Tsujimoto et al., 2015). Pace and Zappulla (2010) found that higher levels of depression lead to more suicidal ideation because higher levels of depression resulted in less willingness to live, more negative thoughts, and more negative feelings. Furthermore, depression has important effects on suicidal ideation both directly and indirectly through other variables (Farabaugh et al., 2012; Lester, 2014).

The life stress experienced by Korean university students is also a major risk factor for suicidal ideation (Kim & Hong, 2016; Jin et al., 2015; Noh et al., 2014). According to previous research, students with higher life stress have higher levels of suicidal ideation. The stress they experience reduces their

desire to live through negative emotions such as anxiety, depression, and frustration; they thus grow lethargic and lose a sense of value in their lives. If this continues, they may begin to want to end their lives. Additionally, excessive life stress can increase suicidal ideation because it weakens the self-defence mechanisms needed to face challenges (Kelliher Rabon et al., 2018). A study by Kim and Hong (2016) found that the number of university students in South Korea who report serious life stress is increasing, as is the number of students who experience suicidal ideation as a result. Excessive life stress is thus a serious risk factor for suicidal ideation among university students.

Some previous studies have suggested that critical communication by parents could be an important family-related risk factor for suicidal ideation in Korean university students (Choi et al., 2012). Parents are the first humans with which children form relationships, and they serve as a human psychological and emotional base of safety. As such, they can be the most important influences on a person's personality, values, behavioural development, interpersonal relationships, and so on (Moretti et al., 2015). Parents' influence remains important even after their children grow up, particularly in South Korea, as Korean parents often identify with their children and maintain mutually dependent relationships with them (Kwon et al., 2016). Therefore, many studies of Korean university students' suicidal ideation have examined parents-related influencing factors. One of these, critical communication by parents, causes children to form negative egos and patterns of thinking, which can lead to more negative feelings and more suicidal ideation (Choi, 2012). Choi (2012) found that university students who experience considerable critical communication from their parents experience more suicidal ideation, indicating that the more parents criticize their children and communicate in a way that reduces their self-esteem, the more negatively they perceive their life, and this results in less self-confidence, less motivation for living, and greater likelihood of suicide.

Finally, many previous studies on suicidal ideation in Korean university students have identified school-related influencing factors among which job stress has recently emerged as important (Hong & Park, 2015; Seo & Lee, 2014). Hong and Park (2015) found that of all causes of suicidal ideation among Korean university students, job stress accounts for the highest percentage. Excessive job competition due to job losses, increasing numbers of irregular workers, and the growing gap between the rich and the poor leads students to experience great stress related to finding a job, and even to consider suicide if the stress persists (Zhang et al., 2012). Specifically, excessive job stress reduces university students' self-esteem and self-efficacy, ultimately making them feel worthless and purposeless in life.

Previous research on Korean university students' suicidal ideation differs in terms of study design, measurement tool, sample size, and year of study. Thus, the different research environments and designs of each study may lead to different outcomes regarding the factors that affect university students' suicidal ideation (Hong et al., 2016). The most commonly used measurement tools in previous studies are the Scale for Suicide Ideation (SSI), developed by Beck et al. (1979), and the Suicidal Ideation Questionnaire (SIQ), developed by Reynolds (1987). The SSI includes 19 questions on specific attitudes, plans, and intensity of actions regarding suicide, all rated on a 3-point Likert scale; the SIQ measures the severity of suicidal ideation through 15 or 30 questions depending on age, all rated on a 7-point Likert scale. The present study examines whether the magnitude of each variable's impact on Korean university students' suicidal ideation differs depending on the measurement tool used.

Thus far, no meta-analysis has been conducted to account for the characteristics of various studies (e.g. sample size, publication year, publication type, etc.) on Korean university students' suicidal ideation. Therefore, the present study, which aggregates risk factors affecting Korean university students' suicidal ideation and analyzes the effects of different study characteristics on the results, is very meaningful in filling this gap.

Meta-analysis of risk factors for suicidal ideation

There are two main methods for aggregating the various results of reports on the same subject. Until the 1990s, narrative reviews were most commonly used. In a narrative review, experts on the subject summarize and draw conclusions regarding the various research findings. However, the strong

subjective characteristics of this method have the disadvantage of producing potentially conflicting results from the same data. Research can also be synthesized by counting significant numbers of studies and deriving final results, but this method's results are also less verifiable. In contrast, the meta-analysis method determines whether to include or exclude studies based on clear criteria, and allows for comparison between the results of various studies by deriving an effect size. This has the advantage of validating causes of heterogeneity through sub-group analysis and meta-regression analysis based on study-specific characteristics (Borenstein et al., 2009).

The present study employs a meta-analysis to aggregate the factors affecting suicidal ideation in Korean university students by deriving their effect sizes. To do this, the average effect size of the major risk factors is first estimated. Then, to determine the reasons for heterogeneity of effect sizes among the results of each study, meta-regression analysis is performed with publication type, publication year, sample size, and measurement tool as moderator variables. Using this method, the present study aims to suggest effective ways to reduce suicidal ideation and prevent suicide in Korean university students.

Methods

Literature search

We collected studies published from 2004 (when studies on suicidal ideation in Korean university students first appeared) to 2019 using the keywords 'suicidal ideation,' 'suicidal thought,' and 'suicidal impulse' from databases such as the Research Information Sharing Service (RISS), the National Assembly Library, and Google Scholar. Articles were included based on the following criteria. First, because this study aimed to integrate research on suicidal ideation and related risk factors in university students, study participants were limited to university students. Second, to calculate the magnitude of effects, studies must have shown a correlation value between suicidal ideation and the risk factors; papers with no correlation values were excluded from the analysis. Third, in cases of overlap between theses and journal articles, the journal articles were included in the analysis.

Figure 1 presents the paper selection per PRISMA guidelines (Moher et al., 2009). A total of 136 studies were identified through the computerized search. a total of 43 articles were excluded because they represented duplicates. An additional 19 were excluded because the titles/abstracts were not relevant. This process resulted in 74 studies to potentially include. The same authors then independently reviewed the full-length version of each study. Studies presenting redundant samples were identified and triaged based on the following parameters, with preference for inclusion presented in sequential order; (a) includes correlations examining suicidal ideation and risk factors, and (b) has a larger sample size. In cases where more than one article utilized the same sample, the articles were considered nonredundant if they reported on different criterion variables. The inclusion of a duplicate sample within these parameters would likely not artificially inflate or deflate individual effect sizes because distinct domains of suicidal ideation were examined. When one article presented two samples and one sample was redundant with the sample of another article, the article was retained for analysis of the nonredundant sample. At this stage, an additional 17 articles were excluded because they represented a redundant sample. Thus, we included a total of 57 articles. At this stage, an additional 17 articles were excluded because they represented a redundant sample ($k = 11$) or did not examine suicide ideation ($k = 6$). Thus, we included a total of 57 articles.

Study coding

Papers that met the inclusion criteria of the present study were selected and the corresponding data were entered. Each study was organized based on the author's name and research subjects and categorized according to publication type (thesis, journal article, research report, and other), publication year, sample size, and measurement tool (SSI, SIQ, and other).

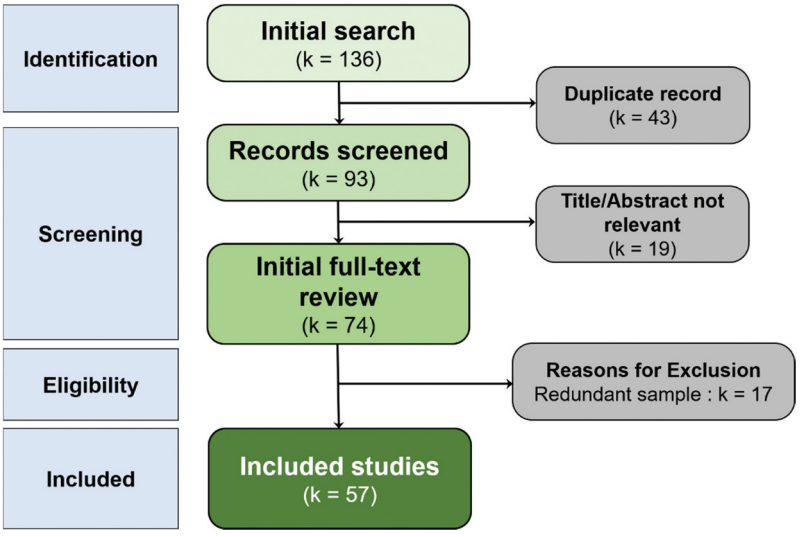

Figure 1. PRISMA flowchart for study selection process.

Effect sizes

Effect sizes in the meta-analysis were calculated based on the correlation value *r* reported by each study included in the data. Because effect size is a standardized value, it allows comparison between studies. It also conveys information about direction along with the size of the values. First, effect size was calculated by converting the correlation value *r* computed by each individual study to Cohen's *d*. If the sample size was small, effect size was corrected using Hedges's *g* to account for bias in the estimate of the *d*-value (Higgins et al., 2003). An effect size of 0.2 is interpreted as small, 0.5 as medium, and 0.8 as large (Cohen, 1998).

Publication bias

The fact that the statistical significance or effect size depending on the sample size is referred to as 'publication bias'. In general, when the sample is of very large size, it is likely to appear statistically significant regardless of its actual statistical significance. That is, because the sample is large size, the results of the statistics may appear to be more exaggerated than they really are. On the other hand, small sample are likely to appear statistically significant only when effect size is large. If studies with publication bias are included in a meta-analysis, the results of the meta-analysis also be systematically biased. Therefore, it is necessary for meta-analyses to confirm whether publication bias is present in the included papers. The present study checked for potential publication bias using a funnel plot, Orwin's fail-safe *N*, and Egger's test of intercept. A funnel plot is a visual representation of studies' results with effect size on the *x*-axis, standard error on the *y*-axis, and a standard error graph to determine whether effect size tends to grow as sample size shrinks. Publication bias is considered present when the graph is bilaterally asymmetrical or the difference between arbitrarily added estimated effect sizes and original effect sizes are substantial, such that the shape of the graphs are symmetrical. Orwin's fail-safe *N* measures how many additional studies must be included to reduce the current effect size to a very small, meaningless effect size. Finally, Egger's test of intercept sets standardized effect size as a dependent variable and accuracy as an independent variable (Egger et al., 2001). If the intercept appears statistically significant and not equal to zero, publication bias is likely present.

Data analysis

All analyses in this study were conducted using Comprehensive Meta-Analysis (CMA) 3.0, and meta-regression analyses to verify the effectiveness of moderator variables were performed using SPSS macro 23.0. Meta-analysis models can be either fixed-effects models, which assume that the collected studies have the same actual effect size, or random-effects models, which assume that the actual effect size varies depending on the study. Because a sufficient number of studies were available for the present meta-analysis, a random-effects model was adopted to confirm heterogeneity, as effect sizes were expected to differ by study according to each study's unique characteristics.

A meta-regression analysis was performed to identify heterogeneity of study-specific effect sizes. In a meta-regression analysis, individual studies are the units of analysis and the study characteristic variables input to an independent variable are moderator variables, as effect sizes depend on these characteristics. In the present study, each influence was examined according to the moderator variables of publication type (thesis, journal article, research report, or other), publication year, sample size and measurement tool (SSI, SIQ, or other).

Results

Relationship between suicidal ideation and depression

Table 1 shows the effect sizes for each study on the relationship between suicidal ideation and depression. The average effect size, 1.908, was statistically significant. The *Q*-value for determining the degree of heterogeneity among each study, 891.314, was also statistically significant. To account for the heterogeneity of effect sizes, moderator variables were included in meta-regression analysis.

The results of meta-regression analysis are shown in Table 2. Only publication year was found to be statistically significant. Specifically, more recently published studies were more likely to associate suicidal ideation with depression. No other study characteristics showed a significant impact.

To identify publication bias, average effect size was assumed to be 0.1 and the cut-off value for a meaningless effect size was set to 0.15 to calculate Orwin's fail-safe *N*. The results indicated that 489 more studies were needed to reduce the effect size below 0.15. As shown in Figure 2, the difference between the corrected and original effect sizes was very small (0.01) after adding studies to ensure the graph was symmetrical using the trim-and-fill method. Finally, Egger's test of intercept revealed that the intercept value was significant ($p < .001$), but when combined with the overall results publication bias was unlikely to be present.

Relationship between suicidal ideation and life stress

Table 3 shows the effect sizes for each study on the relationship between suicidal ideation and life stress. The average effect size, 0.959, was statistically significant. The *Q*-value for heterogeneity, 701.034, was also statistically significant. To account for the heterogeneity of effect sizes, moderator variables were included in meta-regression analysis.

The results of meta-regression analysis are shown in Table 4. None of the moderator variables were found to be statistically significant.

The results for Orwin's fail-safe *N* showed that 104 more studies were needed to reduce the effect size below 0.15. As shown in Figure 3, the difference between the corrected and original effect sizes was very small (0.01) after implementing the trim-and-fill method. Finally, Egger's test of intercept revealed that the intercept value was significant ($p < .001$), but when combined with the overall results publication bias was unlikely to be present.

Table 1. The effect sizes of studies on suicidal ideation and depression.

Author	Year	N	Effect size	SE	Lower value	Upper value	*Z*	*p*	Q
Kim, Chung	2019	386	1.056	.132	1.209	2.101	1.435	.000	
Kim	2018	359	.634	.076	1.489	1.786	2.619	.000	
Kim, Park	2018	274	1.432	.214	1.298	1.987	1.827	.000	
Yoon	2018	1,329	1.481	.079	1.121	3.147	2.072	.000	
Heo	2017	311	1.458	.075	1.314	1.609	9.442	.000	
Park	2017	206	.817	.396	1.213	1.684	6.233	.000	
Lee et al.	2017	157	1.432	.158	2.135	2.753	5.493	.000	
Chung	2016	376	.677	.113	2.461	2.904	2.787	.000	
Hwang et al.	2016	345	1.864	.092	1.688	2.049	2.324	.000	
Jo	2016	164	.933	.138	1.671	2.212	4.086	.000	
Park, Park	2016	394	.854	.130	3.607	4.116	2.732	.000	
Kim	2015	298	.453	.266	4.946	5.987	2.572	.000	
Yang	2015	350	.957	.111	2.746	3.181	6.696	.000	
Kim	2014	326	1.056	.225	4.628	5.508	2.565	.000	
Seo, Lee	Seo & Lee, 2014	734	1.240	.047	1.148	1.334	6.233	.000	
Kang et al.	Kang & Na, 2013	381	.777	.219	4.358	5.215	2.894	.000	
Kang, Na	Kang & Na, 2013	1,037	.665	.066	2.538	2.795	4.642	.000	
Shin et al.	2013	124	1.348	.119	1.122	1.590	1.365	.000	
Park	2013	366	1.068	.142	2.795	3.353	2.574	.000	
Choi	Choi, 2012	310	1.603	.443	1.758	2.492	2.741	.000	
Choi et al.	Choi et al., 2012	418	1.193	.064	1.069	1.321	2.591	.000	
Park	2012	529	.522	.074	2.380	2.672	3.922	.000	
Yoon, Lee	2012	584	.717	.061	1.599	1.839	2.006	.000	
Kim, Choi	2012	317	.089	.074	.948	1.236	4.835	.000	
Kim	2011	290	.509	.198	4.113	4.908	2.871	.000	
Cho	2009	213	.461	.120	3.298	5.102	2.153	.000	
Choi	2008	397	.513	.091	1.201	3.224	1.905	.000	
Total		10,975	1.908	.021	1.890	1.974	10.903	.000	891.314***

Note. N = Sample size, Effect size = Hedges's *g*, SE = Standard error, Lower value and Upper value = 95% confidence interval. *** $p < .001$.

Table 2. The results of meta-regression analysis on suicidal ideation and depression.

Separation	Variables	*b*	SE	Lower value	Upper value	*Z*	*p*	*β*
Individual (Depression)	Publication type	−.082	.121	−.315	.121	−.532	.281	−.038
	Publication year	.053	.301	−.341	.325	.375	.021	.391
	Sample size	.013	.253	.120	.612	−.203	.381	−.291
	SSI	.031	.264	−.291	.321	.289	.291	−.217
	SIQ	.022	.059	−.195	.194	1.482	.457	−.085

Note. Criterion group (0 coding): publishing type (articles in journals), scale (others)

Relationship between suicidal ideation and critical communication by parents

Table 5 shows the effect sizes for each study on the relationship between suicidal ideation and critical communication by parents. The average effect size, 0.550, was smaller than the effect sizes for depression and life stress, but still statistically significant. The *Q*-value for heterogeneity among each study, 128.031, was also statistically significant. To account for the heterogeneity of effect sizes, moderator variables were included in meta-regression analysis.

The results of meta-regression analysis are shown in Table 6. Only publication year was found to be statistically significant. Specifically, more recently published studies were more likely to associate suicidal ideation with critical communication by parents. No other moderator variables showed a significant impact.

The results for Orwin's fail-safe *N* showed that 102 more studies were needed to reduce the effect sizes below 0.15. As shown in Figure 4, the difference between the corrected and original effect sizes was very small (0.01) after implementing the trim-and-fill method. Finally, Egger's test of intercept revealed that the intercept value was significant ($p < .001$), but when combined with the overall results publication bias was unlikely present.

Table 3. The effect sizes of studies on suicidal ideation and life stress.

Author	Year	N	Effect size	SE	Lower value	Upper value	*Z*	*p*	Q
Kim, Lee	2019	188	1.543	.094	1.123	3.257	2.105	.000	
Kim	2018	386	1.391	.179	1.048	2.750	4.560	.000	
Kim	2016	608	1.896	.101	.701	1.098	1.612	.000	
Kim, Hong	J. H. Kim & Hong, 2016	378	1.749	.189	.387	1.130	5.527	.000	
Jeong	Jeong, 2016	376	1.110	.238	.656	1.589	5.710	.000	
Kim	2015	378	.749	.189	.038	.130	3.130	.000	
Kim	2015	298	.977	.163	.668	1.305	1.527	.000	
Kim, Yang, Park	2015	491	1.731	.227	1.296	2.186	1.705	.000	
Jeong et al.	Jeong et al., 2015	446	.997	.016	.675	1.068	1.272	.000	
Yoon	2014	349	1.586	.014	1.320	2.867	5.743	.000	
Yoo	2014	264	1.986	.200	1.605	2.390	1.942	.000	
Park, Kim	2014	672	.197	.069	.077	.180	2.419	.000	
Kim, Song	2014	280	1.580	.022	.167	.728	1.022	.000	
Choi	2013	550	1.661	.074	1.517	1.808	2.419	.000	
Park, Hwang	2013	552	1.052	.029	.063	.192	1.291	.000	
Choi	Choi, 2012	360	1.902	.017	1.572	2.248	1.678	.000	
Shim, Na	2012	287	1.852	.108	1.674	2.069	1.272	.000	
Lee	2011	1253	1.345	.018	1.000	3.679	1.675	.000	
Lee	2010	497	1.451	.012	1.204	4.709	6.862	.000	
Park	2010	350	1.463	.281	.801	1.983	1.569	.000	
Total		8,116	.959	.034	1.435	3.570	8.609	.000	701.034***

Table 4. The results of meta-regression analysis on suicidal ideation and life stress.

Separation	Variables	*b*	SE	Lower value	Upper value	*Z*	*p*	*β*
Individual (Life stress)	Publication type	.115	.039	−.813	1.381	.391	.482	.398
	Publication year	.391	.293	−.192	2.491	.583	.294	.952
	Sample size	.193	.194	.391	2.103	.382	.682	1.294
	SSI	.392	.742	.291	1.294	.483	.492	.294
	SIQ	.192	.621	.194	.591	1.294	.291	.593

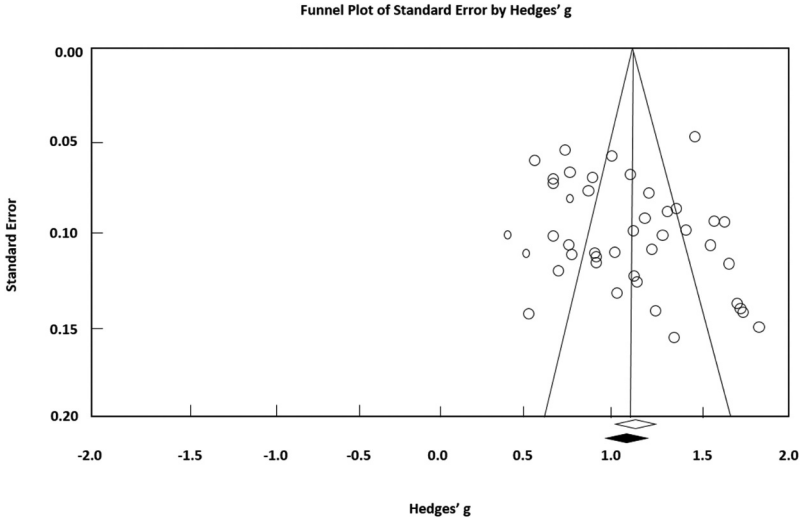

Figure 2. The result of trim and fill methods in suicidal ideation and depression.

Table 5. The effect sizes of studies on suicidal ideation and critical communication by parents.

Author	Year	N	Effect size	SE	Lower value	Upper value	*Z*	*p*	Q
Kang	2017	422	1.100	.124	5.385	6.323	4.486	.000	
Jegar, Park	2017	326	.792	.129	2.546	3.052	2.670	.000	
Jo, Ju, Kim	2016	2500	.348	.065	3.222	3.477	2.467	.000	
Son, Choi	2016	307	.344	.262	4.844	5.871	2.439	.000	
Kim, Lee	2015	489	1.010	.286	2.426	3.582	1.068	.000	
Chung, Rhu	2013	805	2.379	.376	1.653	2.128	1.926	.000	
Choi	Choi, 2012	360	2.121	.353	1.446	2.830	2.045	.000	
Choi, Kim, Kim	Choi et al., 2012	418	1.305	.285	1.757	2.876	2.141	.000	
Kim	2012	265	1.049	.615	1.881	2.291	1.288	.000	
Kim	2011	274	1.100	.124	1.863	2.348	1.043	.000	
Kim	2011	314	.850	.157	2.549	3.164	1.216	.000	
Kim, Kim, Choi	2011	415	.990	.068	.859	1.125	4.645	.000	
Kim	2011	295	1.044	.605	1.273	2.255	1.255	.000	
Kim, Jung	2010	369	.334	.317	1.729	2.969	1.219	.000	
Total		7,559	.550	.038	2.885	3.032	8.683	.000	128.031***

Table 6. The results of meta-regression analysis on suicidal ideation and critical communication by parents.

Separation	Variables	*b*	SE	Lower value	Upper value	*Z*	*p*	*β*
Family	Publication type	.231	.038	.019	.291	1.952	.192	.029
(Critical communication by parents)	Publication year	.038	.048	1.283	.197	2.934	.008	.492
	Sample size	.185	.194	1.295	.281	.184	.291	.097
	SSI	.091	.264	.981	1.392	.018	.853	.293
	SIQ	.182	.391	.018	.195	.014	.753	.192

Relationship between suicidal ideation and job stress

Table 7 shows the effect sizes for each study on the relationship between suicidal ideation and job stress. The average effect size, 0.704, was statistically significant. The *Q*-value for heterogeneity, 129.702, was also statistically significant. To account for the heterogeneity of effect sizes, moderator variables were included in meta-regression analysis.

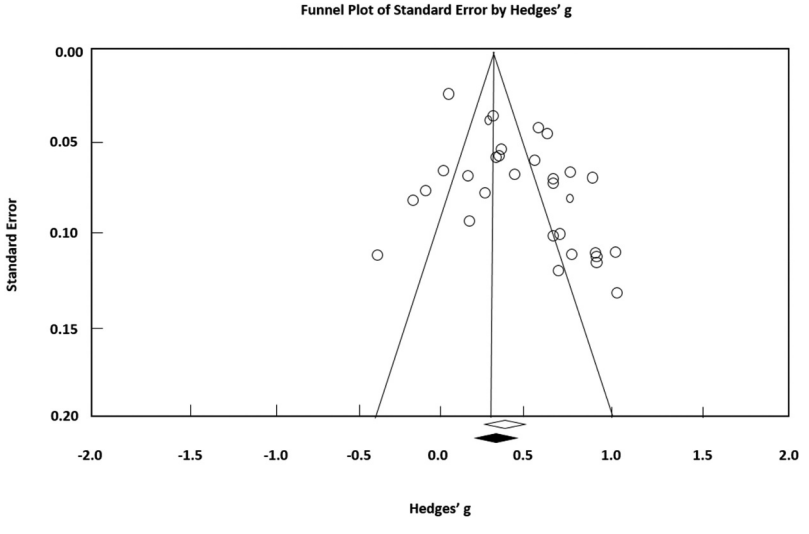

Figure 3. The result of trim and fill methods in suicidal ideation and life stress.

Table 7. The effect sizes of studies on suicidal ideation and job stress.

Author	Year	N	Effect size	SE	Lower value	Upper value	*Z*	*p*	Q
Kim, Park	2018	274	1.136	.187	1.201	2.451	1.952	.000	
Kim, Park	2018	274	.928	.092	2.109	2.983	2.483	.000	
Noh, Park	2018	600	1.310	.098	2.082	3.109	2.104	.000	
Ko, Lee	2017	338	2.025	.179	1.295	1.997	5.342	.000	
Hwang, Jang	2017	253	1.268	.234	1.823	2.738	8.291	.000	
Park	2017	321	1.215	.155	1.920	2.525	5.853	.000	
Heo	2017	319	.733	.233	1.288	2.201	6.371	.000	
Yoon	2016	488	.486	.119	.257	.723	1.921	.000	
No	2016	219	.250	.299	0.243	1.105	5.699	.000	
Hong, Park	2015	218	1.025	.299	1.457	2.629	5.872	.000	
Han, Cho	2015	489	1.787	.220	0.320	1.020	3.699	.000	
Hong	2015	218	.525	.029	0.457	1.629	2.872	.000	
Seo, Lee	Seo & Lee, 2014	734	1.952	.162	0.639	1.738	3.329	.000	
Kim	2013	230	.632	.036	0.898	1.738	1.245	.000	
Yoon, Lee	2012	584	1.990	.171	1.662	2.331	1.249	.000	
Im	2010	213	.888	.027	0.457	1.629	3.178	.000	
Total		5,772	.704	.050	1.606	2.803	7.362	.000	129.702***

Table 8. The results of meta-regression analysis on suicidal ideation and job stress.

Separation	Variables	*b*	SE	Lower value	Upper value	*Z*	*p*	*β*
School (Job stress)	Publication type	−.391	.180	−.303	1.283	−1.293	.182	−.381
	Publication year	−.044	.391	−.471	1.028	−.938	001	.182
	Sample size	.002	.182	−.971	2.381	1.871	.932	.421
	SSI	.039	.019	.193	1.391	.029	.928	.092
	SIQ	.091	.081	.172	1.281	.192	.285	.035

The results of meta-regression analysis are shown in Table 8. Only publication year was found to be statistically significant. Specifically, more recently published studies were more likely to associate suicidal ideation with job stress. No other moderator variables showed a significant impact.

The results for Orwin's fail-safe *N* showed that 72 more studies were needed to reduce the effect size below 0.15. As shown in Figure 5, the difference between the corrected and original effect sizes was very small (0.01) after implementing the trim-and-fill method. Finally, Egger's test of intercept revealed that the intercept value was significant ($p < .001$), but when combined with the overall results publication bias was unlikely to be present.

Discussion

The purpose of this study is to explore ways to reduce Korean university students' suicidal ideation by integrating prior studies on the influence of risk factors that affect their suicidal ideation. Meta-analysis was conducted to determine the effect sizes of these risk factors. The analysis results indicated that depression, life stress, parents' critical communication, and job stress have statistically significant effects on suicidal ideation. In particular, based on Cohen's (1998) criteria, depression showed a large effect size, and the other factors a medium effect size. This result is consistent with other studies that have identified depression as the strongest predictor of suicidal ideation (Chen et al., 2017; Garlow et al., 2008; Jeong, 2016; Pace & Zappulla, 2010; Tsujimoto et al., 2015). In other words, the more depressed university students felt, the more they thought of suicide. Therefore, university students need help in controlling their feelings of depression to ensure that they think less about suicide. Furthermore, they need access to specific information on how to receive counselling, treatment, etc. when considering suicide (Shtayermman et al., 2012).

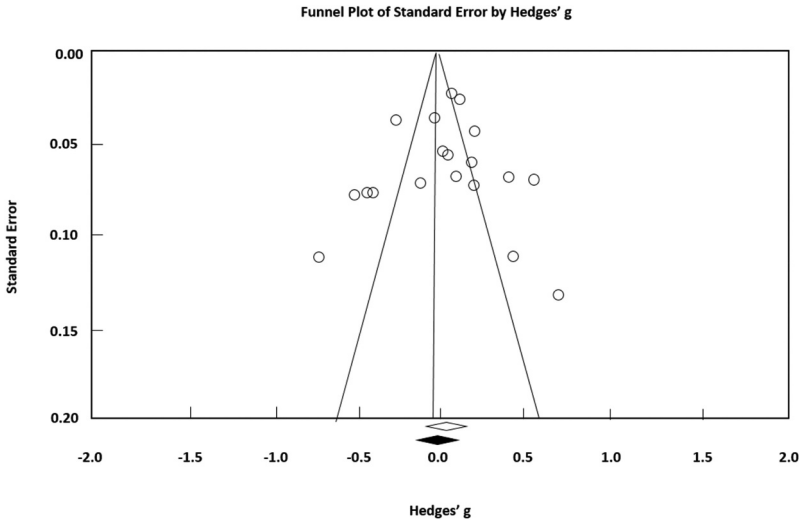

Figure 4. The result of trim and fill methods in suicidal ideation and critical communication by parents.

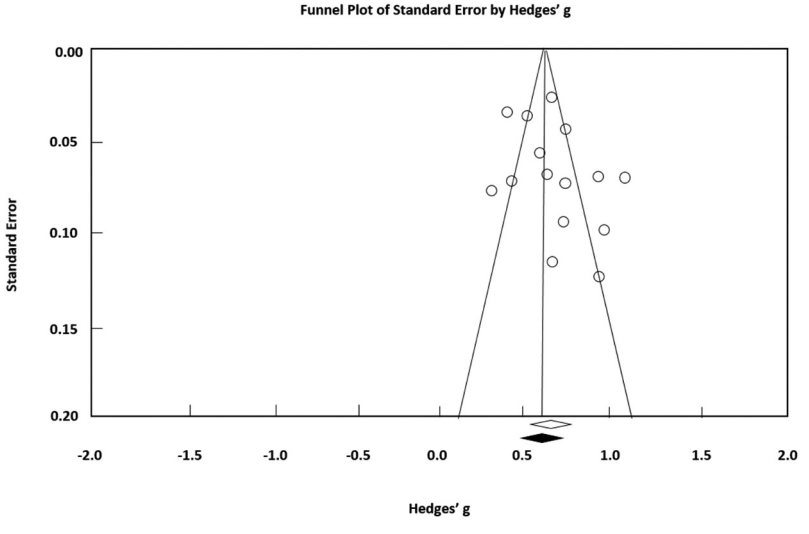

Figure 5. The result of trim and fill methods in suicidal ideation and job stress.

Critical communication by parents is identified as a variable that affects suicidal ideation of Korean university students. This indicates that parents still influence their adult children. This result is consistent with previous findings suggesting that children of parents who negatively communicate are likely to think of suicide (Choi, 2012; Kwon et al., 2016; Shtayermman et al., 2012). How parents communicate with their children significantly impacts their children's psychological states, as they directly or indirectly express emotions, thoughts, beliefs, etc. (Satir et al., 1991). Therefore, the more negative messages parents send to their children, the more their children's psychology is adversely affected, the more they negatively perceive themselves, and the more their inner strength weakens, rendering them vulnerable to suicidal ideation upon encountering difficult life experiences (Gibb et al., 2001). The children raised by parents who maintained close relationship with their children and communicated positively with their children are more likely to have the stable and

healthy psychological states by expressing their emotion, thoughts, beliefs, etc. Thus, parents must positively communicate with their children to reduce Korean university students' suicidal ideation and to empower them to develop self-protection skills. Satir et al. (1991) suggested that internal growth of self-esteem is crucial in addressing the negative effects parents' critical communication might have had on their children. In other words, university students must develop inner strength to judge and resolve the negative words or emotions received from their parents. Therefore, appropriate and easily accessible educational programs and counselling are needed to help university students achieve inner growth.

Stress is another factor that affects Korean university students' suicidal ideation. High levels of stress lead to suicidal ideation. In particular, Korean university students experience much stress while preparing for employment, leading to negative emotions such as anxiety, fear, and lethargy, as well as low self-esteem (Shtayermman et al., 2012). Previous studies have indicated that life and job search-related stress are major factors that lead university students to consider suicide (Seo & Lee, 2014; Van Orden et al., 2008; Zhang et al., 2012). High levels of stress lead to lethargy, diminished self-worth, depression, etc., as life vitality and meaning decrease, which is likely to lead to suicidal ideation (Jin et al., 2015). Moreover, high levels of job stress cause despair, frustration, thoughts about the futility of the future, etc., as one's expectations from life decrease, which is also likely to lead to suicidal ideation (Seo & Lee, 2014). Therefore, Korean university students must be educated on managing life and job search-related stress.

Studies on the relationship among suicidal ideation, depression, parents' critical communication, and job stress reveal that the effect size of these variables differ by year; recent studies demonstrated that depression, parents' critical communication, and job stress have an increasingly greater impact on suicidal ideation. Thus, reducing the influence of these factors is crucial for preventing Korean students' suicidal ideation.

Based on the present results the following measures are proposed to prevent suicidal ideation in Korean university students. First, counselling and treatment must reduce depression in university students by detecting it early. To achieve this, families, schools, and the local community must recognize depression as an important issue and help university students address it before it becomes serious. Students must also be taught how to manage and relieve their stress. Garlow et al. (2008) indicated that university students often miss the critical time for dealing with their depression as they do not have access to good consultation or interventions. Therefore, families and universities should cooperate to reduce or treat depression and suicidal ideation by providing quality mental health services for university students. Furthermore, special lectures or programs on managing depression and stress at university should be run to help students self-manage their emotions and stress. Universities should include mental health content in liberal arts lectures to promote students' understanding of mental health. Finally, communities should raise awareness of depression by alerting the public to its risks and prevention methods.

Second, a national system must be established to organically link homes, schools, communities, and mental health services. This study's results show that factors in various areas have a more than moderate effect on suicidal ideation in university students. Thus, an integrated response must be provided. Currently, the various systems for teenagers (elementary, middle, and high school students) are consolidated, whereas those for university students are independent. The various systems for teenagers are also well integrated, allowing active implementation of suicidal ideation prevention education and counselling programs. In contrast, suicide prevention education and counselling programs for university students are highly insufficient, and those that are implemented are ineffective because the systems are disconnected. Therefore, students' access to mental health services such as suicidal ideation prevention education and counselling programs should be increased by integrating home, school and community.

This study makes several meaningful contributions to the literature. First, it systematically organizes and aggregates effect sizes for the results of existing studies on the link between university students ' suicidal ideation and various risk factors. Second, by comparing the effect sizes among risk

factors, it provides substantial data for developing and implementing future suicide prevention education programs for university students. Third, unlike many previous meta-analytic studies, this study used a random-effects model to estimate average effect sizes, examined publication bias, and conducted meta-regression analysis of heterogeneity of effect sizes. These research methodologies could benefit future researchers seeking to apply a meta-analytical approach.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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