Suicidal Ideation in South Korean: A Systematic Review

Seonjae Been, *Haewon Byeon

Department of Digital Anti-Aging Healthcare (BK21), Inje University, Gimhae 50834, Republic of Korea

***Corresponding Author:** Email: bhwpuma@naver.com*

Abstract

Background: We systematically reviewed (evaluated methodological quality) meta-analysis studies on the suicidal ideation of South Koreans using a measurement tool to assess systematic reviews version 2 (AMSTAR-2) to present the ways for improving the quality of follow-up meta-analysis studies and suggest the direction of future studies.

Methods: We analyzed 11 meta-analysis studies based on AMSTAR-2 criteria by collecting documents related to suicidal thoughts using seven electronic databases (DBPia, Scholar, KISS, KCI, RISS, KoreaEmbase, and National Assembly Electronic Library) from Jan 1, 2000 to Dec 3, 2022.

Results: Among the 142 papers searched, we analyzed the final 11 selected studies. Not all analyzed meta-analysis studies conducted quality assessment and these studies omitted the list of excluded references and the adequacy of the literature search. Moreover, 54.5% of the analyzed studies (six out of eleven studies) did not present the effect of publication bias. Consequently, SOMETHING was critically low due to omissions in critical domains.

Conclusion: In all 11 studies analyzed, 2 or more of 7 critical domains were omitted, and the quality level was confirmed to be critically low. Therefore, future meta-analysis studies on suicidal ideation will have to include quality assessment and improve the quality of meta-analysis, such as testing bias effects.

Keywords: Suicidal ideation; Methodological quality; Meta-analysis; Systematic review

Introduction

The suicide rate in South Korea is 24.6 people, which is 2.2 times of OECD member countries' mean suicide rate (11 people) and the highest among OECD countries (1). The suicide rate in South Korea doubled from 10 people in 1983 to 20 people in 2003 (2). At the same time, the number of depressives has continuously increased over the past ten years, and the total annual treatment cost for depression also increased by 73.5% in 2021 compared to 2017, from 246.59 million USD in 2017 to 427.84 million USD in

2021 (3,4).

Depression is one of the representative causes of suicidal ideation, and it affects overall daily life, including thoughts, emotions, motivation, and physical activities. The psychological autopsy results of the Ministry of Health and Welfare estimated that 82.1% of suicides subject to psychological autopsy had depressive disorders (5). Although depression and suicide are closely related, and the social awareness of depression and neuropsychiatry has been improved, depressed

people still have a low utilization rate of medical institutions (6). Therefore, it is difficult to diagnose depression early and identify groups highly vulnerable to suicide.

Suicide can be divided into suicidal ideation, a suicide plan, and a suicide attempt (7). They should be viewed as a series of stages, not independent stages (7). Suicidal ideation, a suicide plan, and a suicide attempt refer to thoughts related to suicide, making a specific plan for suicide, and the act of taking one's own life, respectively. Among them, suicidal ideation is a stage prior to a suicide attempt and a strong predictor of suicide (8,9). Particularly, although not everyone who had suicidal, thoughts would not attempt suicide; those who experienced suicidal ideation had approximately 32 times higher risk of a suicide attempt than those who never thought about suicide (10). As the suicide rate emerged as a serious social problem, studies on suicide and suicide-related variables drew a lot of attention.

A meta-analysis is used to evaluate the effects by calculating the estimated figures of individual studies after conducting a systematic review of studies published to date (11). A meta-analysis can derive statistically improved power and precision compared to individual studies (12). It is also useful because it can draw new conclusions (13). In other words, meta-analysis is used as an integrated analysis that can make integrated judgments from various perspectives (14), which becomes an important indicator of future research directions (15).

Evaluation criteria and tools have been created and developed in various fields to evaluate the quality of meta-analysis. Starting with the separation between meta-analysis and systematic review, various methods have been used. These methods include the quality of reporting meta-analysis of randomized controlled trials (QUOROM), preferred reporting items for systematic reviews and meta-analysis (RRISMA) that is an evaluation criterion applicable to various disciplines (16); and the meta-analysis of observational study in epidemiology (MOOSE) that is a report guideline for observational studies in epidemiology (17).

Besides, Meta-analysis reporting standards (MARS) (18) that is a meta-analysis tool of the American Psychological Association, and the risk of bias in non-randomized studies of interventions (ROBINS-I) (19) that can be used in non-randomized studies. Among these meta-analysis quality assessment tools, a measurement tool to assess systematic reviews version 2 (AMSTAR-2), published in 2007, is to evaluate the methodological quality in systematic reviews (20,21). It is a practical critique assessment tool used by related experts, and it is one of the most commonly used tools in the systematic literature review (20,21). AMSTAR-2 expands the evaluation area from the previous AMSTAR, and it can conduct a more detailed evaluation than AMSTAR.

We evaluated the methodological quality of meta-analysis studies on the suicidal ideation of South Koreans and suggested the qualitative improvement and direction of follow-up meta-analysis studies.

Methods

### Study subjects and data collection

This systematic review targeted papers published from Jan 1, 2000 to Dec 3, 2022. We used the search term "suicidal ideation", "suicidal ideations", "suicidal AND ideation", "suicidal AND ideaations", "meta", "meta-analysis", "Meta-Analysis as Topic", "Network Meta-Analysis", "Systematic Reviews as Topic", and "systematic review" to search for meta-analysis studies (full text) with suicidal ideation as a dependent variable. This study used DBPia, Scholar, Korean studies Information Service System (KISS), Korea Citation Index (KCI), Research Information Sharing Service (RISS), Korea Embase, and National Assembly Library databases.

Fig. 1 presents the flow diagram of this study. The selection criteria of analysis subjects (publications) were that 1) this study collected only meta-analysis studies on the subject of suicidal ideation, 2) this study collected only publications that we could check in full text, and 3) if a certain publication was also published as a thesis, a type

of grey literature, this study selected publications published peer-review journals. We analyzed eleven meta-studies after excluding publications that did not meet the selection criteria.
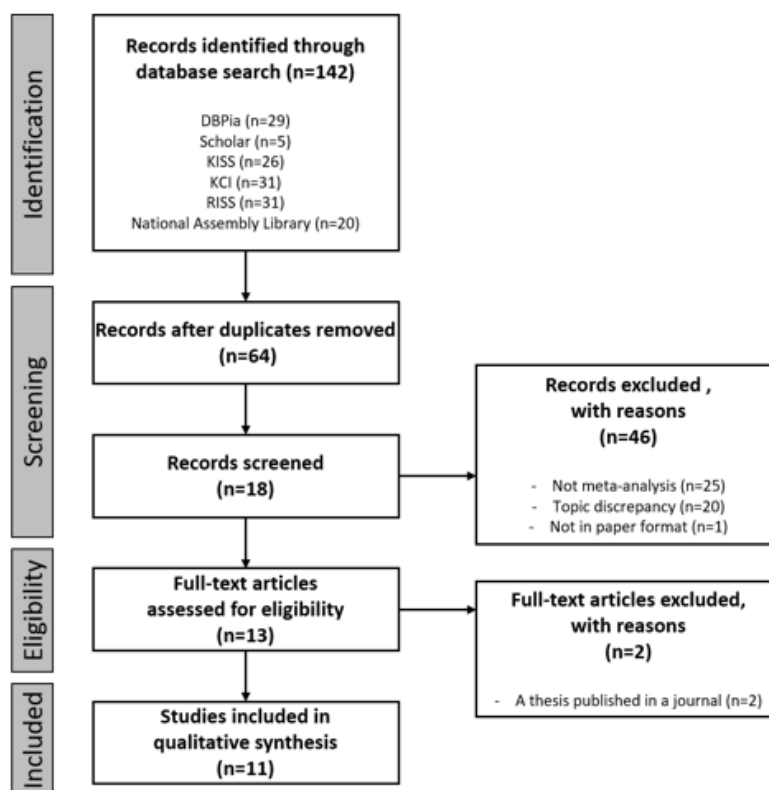
Fig. 1: Flow diagram of study

Analysis tool for quality evaluation

This study used AMSTAR-2 for quality evaluation. Table 1 presents the evaluation domains and criteria of AMSTAR-2. AMSTAR-2 has critical domains. The quality evaluation level is determined based on the judgment of the critical domains. The evaluation criteria for the response consisted of "yes"(score: 1), "partial yes"(score: 0.5), and "no"(score: 0). Moreover, the results were divided into high, moderate, low, and very low. The 16 items of AMSTAR-2 were divided into items included in the critical domains and those included in the non-critical domains. When one item is omitted in the critical domains ("partial yes" or "no"), overall confidence was treated as "low". If two or more items were missing, it was evaluated as "Critically low". Conversely, if there was no missing information in all domains or only one item was omitted in the non-critical domains, it was evaluated as "high". If two or more items were omitted, it was evaluated as "moderate".

Because of independent quality evaluation by two reviewers for the finally selected literature, the concordance rate was 90%. In the case of items where the two evaluators did not agree, the evaluators discussed with each other to reach an agreement on the evaluation results.

Table 1: Evaluation items of AMSTAR-2

No	Questions	Evaluation (Score)
1	Did the research questions and inclusion criteria for the review include the components of PICO(Patient or problem or population, Invention, Comparison, Outcome)?	- Yes (1) - No (0)
2*	Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	- Yes (1) - Partial Yes (0.5) - No (0)
3	Did the review authors explain their selection of the study designs for inclusion in the review?	- Yes (1) - No (0)
4*	Did the review authors use a comprehensive literature search strategy?	- Yes (1) - Partial Yes (0.5) - No (0)
5	Did the review authors perform study selection in duplicate?	- Yes (1) - No (0)
6	Did the review authors perform data extraction in duplicate?	- Yes (1) - No (0)
7*	Did the review authors provide a list of excluded studies and justify the exclusions?	- Yes (1) - Partial Yes (0.5) - No (0)
8	Did the review authors describe the included studies in adequate detail?	- Yes (1) - Partial Yes (0.5) - No (0)
9*	Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	- Yes (1) - Partial Yes (0.5) - No (0)
10	Did the review authors report on the sources of funding for the studies included in the review?	- Yes (1) - No (0)
11*	If meta-analysis was performed, did the review authors use appropriate methods for statistical combination of results?	- Yes (1) - No (0) - No meta-analysis conducted
12	If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	- Yes (1) - No (0) - No meta-analysis conducted
13*	Did the review authors account for RoB in individual studies when interpreting/discussing the results of the review?	- Yes (1) - No (0)
14	Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	- Yes (1) - No (0)
15*	If they performed quantitative synthesis, did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	- Yes (1) - No (0) - No meta-analysis conducted
16	Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	- Yes (1) - No (0)

* AMSTAR-2 Critical Domain

Results

General characteristics of analyzed studies

Table 2 shows the analysis results after dividing the general characteristics of the analyzed studies by author, year of publication, study subject,

publication type, method, analysis period, and the number of analyzed studies. Among the eleven studies, six studies (54.5%), four studies (36.3%), and one study (9.1%) examined adolescents, older adults, and college students, respectively.

Table 2: General characteristics of analyzed studies

References	Author (Year of Publication)	Study Subjects	Publication Type		Methods	Analysis Period	No. of Studies Included
			Thesis	Peer-review Journal			
(22)	Lee et al. (2016)	Elderly	X	O	Two-group meta analysis	2001-2015	53
(23)	Jin et al. (2016)	Teenager	O	O	Meta-analytic path analysis	1990-2012	433
(24)	Ahn et al. (2015)	College student	X	O	Two-group meta analysis	2005-2015	102
(25)	Moon (2012)	Elderly	X	O	Meta-regression analysis	2001-2011	49
(26)	Moon et al. (2011)	Teenager	X	O	Meta-regression analysis	2000-2010	69
(27)	Kim et al. (2009)	Teenager	O	O	Two-group meta analysis	2000-2007	58
(28)	Lee et al. (2017)	Elderly	X	O	Meta analysis on the Correlation	2001-2016	97
(29)	Hong et al. (2016)	Teenager	X	O	Meta-regression analysis	2000-2014	57
(30)	Moon et al. (2012)	Teenager	X	O	Meta-regression analysis	2000-2010	69
(31)	Hong et al. (2016)	Teenager	X	O	Meta-regression analysis	1998-2014	48
(32)	Moon (2012)	Elderly	X	O	Meta analysis on the Correlation	2002-2011	45

Methodological qualitative evaluation of meta-analysis studies related to suicidal ideation

Table 3 presents the quality evaluation results of meta-analysis studies related to suicidal ideation by using AMSTAR-2. All analyzed publications had two or more omissions in the critical domains, which indicated that the quality evaluation level was critically low. Specifically, the protocol registered before commencement of the review (item 2) of the systematic review was not qualitatively evaluated in all previous meta-analyses. Moreover, the risk of bias from individual studies being included in the review (item 9), the consideration of risk of bias when interpreting the results of the review (item 13), and heterogeneity

observed in the results of the review (item 14) were not qualitatively evaluated in all prior meta-analysis studies.

Justification for excluding individual studies (item 7) was evaluated as low because not all analyzed studies presented a list of excluded references. The adequacy of the literature search (item 4) was also evaluated as low in all analyzed studies. This item aims to evaluate literature search strategies comprehensively. The quality evaluation level was low because not all publications selected for analysis searched the list of references included in individual studies or they did not explicitly indicate a grey literature search. Among the eleven studies, only six studies (23,25,27-29,31) searched

literature using two or more databases and presented search keywords and reasons for publication restrictions. Although the assessment of presence and likely impact of publication bias

(item 15) was essential in systematic review studies, six studies (54.5%) (25-28,30,32) did not evaluate publication bias.

Table 3: Qualitative methodological evaluation of meta-analysis studies using AMSTAR-2

No	Items from AMSTAR-2*																Score	Overall confidence
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
1	1	0	1	0	1	1	0	1	0	1	1	0	0	0	1	1	9	Critically low
2	1	0	0	0.5	0	0	0	0	0	0	1	0	0	0	1	1	4.5	Critically low
3	1	0	1	0	1	1	0	0	0	1	0	0	0	0	1	1	7	Critically low
4	1	0	1	0.5	1	1	0	0	0	0	1	0	0	0	0	1	6.5	Critically low
5	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	1	6	Critically low
6	1	0	1	0.5	1	1	0	0	0	0	1	0	0	0	0	1	6.5	Critically low
7	1	0	1	0.5	0	0	0	0	0	1	1	0	0	0	0	1	5.5	Critically low
8	1	0	0	0.5	0	0	0	0.5	0	1	1	0	0	0	1	1	6	Critically low
9	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	1	6	Critically low
10	1	0	1	0.5	0	0	0	0	0	1	1	0	0	0	1	1	6.5	Critically low
11	1	0	1	0	1	1	0	0	0	0	1	0	0	0	0	1	6	Critically low

*Q2,Q4,Q7,Q9,Q11,Q13,Q15 are included in the critical domains of AMSTAR-2

Discussion

We evaluated the quality of meta-analysis studies on the suicidal ideation of South Koreans by using AMSTAR-2. Surprisingly, the quality of all eleven meta-analysis studies analyzed in this study was critically low. It was because the quality assessment was not performed in any of the analyzed studies. The meta-analysis is a technique for evaluating the effect size by combining the effect values (estimates) from two or more individual studies (33). A systematic literature review must be conducted while considering participants, interventions, comparisons, and outcomes, in addition to effect values. At the same time, a systematic literature review must identify the objectivity and validity of previous studies by evaluating the bias in the process and results of the studies using qualitative evaluation tools. If such quality assessment is omitted in a meta-analysis study, the scientific basis may be distorted because the effect size is evaluated by combining the effect values (estimates) of individual studies without distinguishing studies with low objectivity and validity from studies with high objectivity and

validity (34). For this reason, studies with a low quality level should not be included in the meta-analysis to carry out an accurate meta-analysis (35). The results of this study proposed that quality evaluation had to be included when conducting a meta-analysis study on suicidal ideation in the future.

Another finding of this study was that 54.5% of the analyzed meta-analysis studies did not test publication bias. Publication bias refers to bias generated because studies reporting significant results are more likely to be published or published more quickly than studies that do not show significant results (36,37). When publication bias was high in a meta-analysis study, it could exaggerate scientific evidence, which could cause a problem (36). Since publication bias is an essential item to improve the reliability and validity of studies, it is a critical domain of AMSTAR-2. However, publication bias was not conducted in six studies (25-28,30,32) among the eleven meta-analysis studies analyzed in this study. Therefore, future meta-analysis studies need to include publication bias verification results of individual studies to enhance scientific grounds.

The importance of this study was that this study

conducted a systematic literature review on the quality level of previous meta-analysis studies, proposed the direction of future studies, and promoted qualitative improvement by suggesting performing an essential process in a meta-analysis, such as bias evaluation.

This study had three limitations. First, it is difficult to generalize the results of this study because this study evaluated quality based on meta-analysis studies published in South Korea. Second, although AMSTAR-2 can be used for both randomized and non-randomized studies, since all selected studies were observational studies, it was insufficient to match accurately the categories of AMSTAR-2's items. Third, even though this study searched publications not in the academic paper format, such as theses and reports, there could be grey literature not included in this study. Additional systematic review studies are needed to analyze comprehensively meta-analysis studies, including grey literature such as theses and reports.

Conclusion

We systematically reviewed eleven meta-analysis studies related to the suicidal ideation of South Koreans to confirm that quality evaluation was omitted, a list of excluded references was not included, and the adequacy of the literature search was inappropriate. In particular, the quality of the meta-analysis study was not guaranteed because all the studies analyzed were missing two or more out of seven items corresponding to the critical domain and the quality level was evaluated as critically low. Future meta-analysis studies on suicidal ideation must include quality assessment and improve the quality of meta-analysis, such as testing bias effects.

Acknowledgements

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Conflict of interest

The authors declare that there is no conflict of interests.

References

1. Ministry of Health and Welfare, Korea foundation for suicide prevention (2022). *White paper on suicide prevention*. Jung-gu: Korea Foundation for Suicide Prevention. Seoul.
2. K·indicator (2022). Suicide rates. https://www.index.go.kr/unify/idx-info.do?idxCd=8040
3. National Center for Mental Health (2019). heart's bottle, Get to know depression correctly and overcome it. https://www.ncmh.go.kr:2453/ncmh/board/boardView.do?no=8536&menu_cd=01_01
4. Health Insurance Review and Assessment Service (2022). Recent 5 years (2017-2021) Depression and Anxiety Disorder Current Status Analysis. https://www.hira.or.kr/bbsDummy.do?pgmid=HIRAA020041000100&brdScnBltNo=4&brdBltNo=10627&pageIndex=1
5. Ministry of Health and Welfare (2022). Suicide psychological autopsy, death speaks life. https://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&page=1&CONT_SEQ=372221
6. Health Insurance Review & Assessment Service (2019). Preparation of measures to assess the adequacy of outpatient treatment for depression. Won-ju: Health Insurance Review and Assessment Research Institute. Gangwon-do.
7. López-Goñi JJ, Fernández-Montalvo J, Arteaga A, Haro B (2019). Suicidal attempts among patients with substance use disorders who present with suicidal ideation. *Addict Behav,* 89: 5-9.

8. Kim HS (2002). A Study on Epistemology of Korean Elder`s Suicidal Thought. *Journal of the Korea Gerontological Society*, 22(1): 159-72.

9. Klonsky ED, May AM, Saffer BY (2016). Suicide, suicide attempts, and suicidal ideation. *Annu Rev Clin Psychol*, 12: 307-30.

10. Park E (2008). The Influencing Factors on Suicide Attempt among Adolescents in South Korea. *Taehan Kanho Hakhoe Chi*, 38(3):465-73.

11. Field AP, Gillett R (2010). How to do a meta-analysis. *Br J Math Stat Psychol*, 63(Pt 3): 665-94.

12. Akobeng AK (2005). Understanding systematic reviews and meta-analysis. *Arch Dis Child,* 90(8): 845-48.

13. Hirschnitz-Garbers M, Stoll-Kleemann S (2011). Opportunities and barriers in the implementation of protected area management: a qualitative meta-analysis of case studies from European protected areas. *The Geographical Journal*, 177(4): 321-334.

14. Lee JG, Hwang JS (2018). A Qualitative Evaluation of Meta-Analysis Research - Application of AMSTAR Guideline. *The Korean Journal of Advertising and Public Relations*, 20(4): 514-42.

15. Thacker SB (1988). Meta-analysis: a quantitative approach to research integration. *JAMA*, 259(11): 1685-689.

16. Shin IS, Park EY (2011). Review of the Meta-Analysis Research in Special Education and Related Field. *The Education Journal for Physical and Multiple Disabilities*, 54(4): 157-76.

17. Lystad RP, Pollard H, Graham PL (2009). Epidemiology of injuries in competition taekwondo: A meta-analysis of observational studies. *J Sci Med Sport,* 12(6): 614-21.

18. Kepes S, McDaniel MA, Brannick MT, Banks GC (2013). Meta-analytic reviews in the organizational sciences: Two meta-analytic schools on the way to MARS (the Meta-Analytic Reporting Standards). *J Bus Psychol*, 28: 123-43.

19. Sterne JA, Hernán MA, Reeves BC et al. (2016). ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*, 355:i4919.

20. Perry R, Whitmarsh A, Leach V, Davies P (2021). A comparison of two assessment tools used in overviews of systematic reviews: ROBIS versus AMSTAR-2. *Syst Rev*, 10(1):273.

21. Shea BJ, Reeves BC, Wells G et al. (2017). AMSTAR-2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ*, 358:j4008. .

22. Lee SJ, Jeong GI (2016). Meta-analysis of Suicidal Ideation in Elderly. *J Korean Data Anal Soc,* 18:1023–1033.

23. Jin HM, Bae SW (2016). Meta - Analytic Path Analysis of Suicidal Ideation in Adolescence - Based on the Stress Process Model. *Korean Journal of Youth Welfare*, 18(2): 85-113.

24. An S, Choi BY, Kim J (2015). Meta-Analysis on Variables Related to Suicidal Ideation among College Students. *The Korean Journal of School Psychology*, 12(3): 385-405.

25. Moon DK (2012). A Meta-Regression Analysis on Related triggering Variables on the Suicidal Ideation of Older Adults. *Journal of Welfare for the Aged Institute*, 55: 133-57.

26. Moon DK, Kim YH (2011). A Meta-Regression Analysis on Related triggering Variables of Adolescents` Suicidal Ideation. *Korea Journal of Counseling*, 12(3): 945-64.

27. Kim BY, Lee CS (2009). A Meta-Analysis of Variables Related to Suicidal Ideation in Adolescents. *J Korean Acad Nurs*, 39(5): 651-61.

28. Lee J, Lyu JY (2017). Suicide among the Elderly in Korea: A Meta-Analysis. *Journal of the Korea Gerontological Society*, 37(3): 601-16.

29. Hong SH, Jung S, No UK (2016). A Meta-analysis on relationship between adolescents' suicidal ideation and risk factors. *Korean Journal of Youth Studies*, 23(5): 153-79.

30. Moon DK, Kim YH (2012). A Meta-Regression Analysis on Related protective Variables of Adolescents` Suicidal Ideation. *Korean Journal of Youth Studies*, 19(1): 59-83.

31. Hong SH, No UK, Jung S (2016). Meta-analysis about Relationship between Adolescents` Suicidal Ideation and Protective Factors. *Survey Research*, 17(1): 137-66.

32. Moon DK (2012). A Meta-Analysis on Related Protective Variables on the Suicidal Ideation of Older Adults. *Korean Journal of Social Welfare Education*, 17: 144-66.

33. Hedges LV, Tipton E, Johnson MC (2010). Robust variance estimation in meta-regression

with dependent effect size estimates. *Res Synth Methods*, 1(1): 39-65.

34. Egger M, Smith GD, Altman DG (2001). *Systematic reviews in health care: meta-analysis in context*. London: BMJ Publishing Group. United Kingdom.

35. Sutton AJ, Abrams KR, Jones DR (2001). An illustrated guide to the methods of meta-analysis. *J Eval Clin Pract*, 7(2): 135-48.

36. Sham E, Smith T (2014). Publication bias in studies of an applied behavior-analytic intervention: An initial analysis. *J Appl Behav Anal*, 47(3): 663-78.

37. Kim SY (2006). Evidence-based Medicine and Systematic Review. *Quality Improvement in Health Care*, 12(2): 35-40.