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ORIGINAL ARTICLE

Relation Between Attributional Style and Subsequent Depressive Symptoms: A Systematic Review and Meta-Analysis of Longitudinal Studies

Chiungjung Huang[1]

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Abstract This meta-analysis examined the relation between attributional style and subsequent depressive symptoms. Results were based on 52 longitudinal studies comprising 57 samples involving 12,594 participants. A moderate correlation was found between depressogenic explanatory style of negative events and subsequent depressive symptoms. Controlling for prior depressive symptoms, the weighted mean effect of prior negative attributional style on subsequent depressive symptoms was small at $\beta = .10$. The relation between attributional style and subsequent depressive symptoms was not associated with moderators including publication status, attributional style measure, depression measure, delay between assessments, mean age, participant gender, and ethnicity.

Keywords Attributional style · Depressive symptoms · Longitudinal · Meta-analysis

Introduction

According to learned helplessness theory (Abramson et al. 1978; Peterson et al. 1982; Peterson and Seligman 1984; Seligman 1975), individuals who attribute negative outcomes to internal, stable and global causes are more likely to be depressed than those who attribute negative outcomes to external, unstable, and specific causes. Conversely, attribution of positive outcomes to external, unstable, and specific causes is positively related to depressive symptoms. Numerous studies have examined the relation between attributional style and depression and obtained varied results. For example, Abela and Brozina (2004) sampled 86 undergraduate students and found a large correlation ($r = .54$) between generality score and subsequent depression assessed 6 weeks later. Meanwhile, a moderate correlation ($r = .27$) was found in McCarty et al. (2007) who used the data from the Developmental Pathways Program, whereas Edelman et al. (1994) reported low correlations. Specifically, the correlation between generality score and subsequent depression was 0 and that between internality score and subsequent depression was .02 for 91 undergraduate students with an initial score of 9 or above on the Beck Depression Inventory (BDI). As varied findings were obtained, a meta-analysis that can provide an overall estimate of these findings would be valuable.

Although three meta-analyses (Gladstone and Kaslow 1995; Joiner and Wagner 1995; Sweeney et al. 1986) were conducted to provide overall estimates of the relation, their findings varied. For example, Sweeney et al. (1986) reported the correlations between attributional style and depression ranged from low to moderate, while those in Gladstone and Kaslow (1995) and Joiner and Wagner (1995) ranged from moderate to large. Further, most studies included in these three meta-analyses adopted cross-sectional designs and therefore they did not clarify the effect of attributional style on subsequent depression. To date, several longitudinal studies were conducted to determine the effect of attributional style on subsequent depression. Jacobs et al. (2008) systematically reviewed 21 longitudinal studies and suggested the effect of prior attributional style on subsequent depression in youths. However, they excluded studies of adults and did not

✉ Chiungjung Huang
cjhuang@cc.ncue.edu.tw

[1] Graduate Institute of Education, National Changhua University of Education, 1 Jinde Road, Changhua 50058, Taiwan

estimate the overall magnitude of the relation between attributional style and subsequent depression. Meta-analysis on the relation between prior attributional style and subsequent depressive symptoms was lacking. As literature on the relation between attributional style and subsequent depressive symptoms indicated that the magnitude of this relation may vary as a function of various situations which the research is conducted. The aims of the current meta-analysis were two twofold: to estimate the overall magnitude of the correlation between attributional style and subsequent depressive symptoms and examine whether moderating variables affect this correlation.

The current meta-analysis differed from previous meta-analyses in several important respects. First, because the major interest was to examine the relation between prior attributional style and subsequent depressive symptoms, longitudinal studies were included. Second, more potential moderators were considered to clarify the varied correlation between attributional style and subsequent depressive symptoms. Third, samples of all ages were included. Last, both published and unpublished studies were included.

Moderators

A major advantage of meta-analysis is that it can reveal the potential effect of moderators on the relation between attributional style and subsequent depressive symptoms. Some moderators including attributional style and depression measures and delay between assessments were described as follows.

Measure of Attributional Style

The magnitude of the relation between attributional style and subsequent depressive symptoms may vary with the measure of the former. Commonly used measures are the Children's Attributional Style Questionnaire (CASQ; Seligman et al. 1984), Attributional Style Questionnaire (ASQ; Peterson et al. 1982; Seligman et al. 1979), Extended Attributional Style Questionnaire (EASQ; Metalsky et al. 1987), and the subscale of causal attribution of the Cognitive Style Questionnaire (CSQ; Abramson and Metalsky 1989; Haeffel et al. 2008). Although all these scales assess attributional style, they vary in psychometric properties and target age-range. For example, the CASQ was usually applied to children. This 48-item scale measures participant attributions of hypothetical positive and negative events to internal, stable, and global causes. Items measured one dimension (internality) while the other two dimensions (stability and globality) were held constant. Hence, each dimension had 16 items, comprising eight positive and eight negative events. The CASQ suffered low reliability. Cunningham (2003) examined the reliability of CASQ scores for 359 5th and 6th grade students and found that the internal consistency reliability ranged from .19 to .41 for the subscales and .54 for the full scale.

The Children's Attributional Style Questionnaire-Revised (CASQ-R; Kaslow and Nolen-Hoeksema 1991; Thompson et al. 1998) is a 24-item shortened measure derived from the CASQ. As the reliability decreased with decreasing length of scale, the reliability of the CASQ-R was expected to be low. For example, McCarty et al. (2007) used a two-wave design and found that the Cronbach's alpha coefficients of CASQ-R scores for negative events were .36 (Time 1) and .45 (Time 2).

The ASQ (Peterson et al. 1982; Seligman et al. 1979) is composed of six positive and six negative events and typically used in adults. Six items are interpersonal while the other six are achievement-related. Each item is endorsed using a 7-point Likert scale. Higgins et al. (1999) found support for the 3-factor model in a survey of 1346 freshmen. The reliability of the ASQ negative composite scores was .67, .73 for positive composite scores, .34 for negative internality, .46 for positive internality, .61 for negative stability, .58 for positive stability, .58 for negative globality, and .53 for positive globality. The 3-factor model was also supported by Hewitt et al. (2004) who used a sample of 2748 British freshmen to test the factor structure for negative outcomes.

The EASQ was a modification of the ASQ and is also used for adults. To address the low reliability of the ASQ, the EASQ comprises 12 positive and 12 negative events, evenly split between achievement and interpersonal. Joiner and Metalsky (1999) examined the factor structure of the EASQ for two groups of college students and found that the stability and globality dimensions were discriminable while the internality dimension suffered poor reliability.

The CSQ was modified and expanded of the ASQ (Abramson and Metalsky 1989; Haeffel et al. 2008) and used for college students. The CSQ consists of three subscales: causal attributions, consequences, and self-worth characteristics. The subscale of causal attribution of the CSQ comprises 12 positive and 12 negative events. Each item of the subscale of causal attribution was on a 7-point Likert scale. Haeffel et al. (2008) reviewed studies examining the reliability of the subscale of causal attribution of the CSQ and reported that the internal consistency reliability was high, ranging from .85 to .91. As these measures vary in psychometric properties, length, and target populations, it is legitimate to examine whether the measure of attributional style was related to the relation between attributional style and subsequent depressive symptoms.

Measure of Depression

Because different measures of depression may assess different contents, they may differ in their associations with

attributional style. Both the BDI (Beck et al. 1961) and Children's Depression Inventory (CDI; Kovacs 1992) are commonly used measures in children, adolescents, and adults. Both measures have been subjected to intense psychometric evaluation and they exhibit similarities and dissimilarities. The BDI is a 21-item scale commonly used to measure depression intensity for individuals diagnosed as clinically depressed in the past 2 weeks. Each item of the BDI is rated on a 4-point scale that ranges from 0 to 3 and has the advantage of easy administration and strong psychometric properties (McPherson and Martin 2010). No items have been formally assigned to BDI subscales. Shafer (2006) examined the factor structure for the BDI via meta-analysis and found the 3-factor model was supported. The three factors were Negative Attitudes toward the Self defined by 11 items, Performance Impairment, defined by seven items, and Somatic concerns, defined by three items.

The CDI, consisting of 27 items, was based on items in the BDI and designed exclusively for assessing depression severity in children and adolescents. Three options exist for scoring each CDI item, namely 0 for no symptoms, 1 for mild symptoms, and 2 for clear symptoms. The CDI items are formally assigned to one of five subscales (Kovacs 1992): Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia and Negative Self-Esteem. Huang and Dong (2014) conducted a meta-analysis of the factor structure of the CDI. The analysis included 24 studies, comprising 35 independent samples involving 18,099 participants. Although the 5-factor solution was supported for the full sample, the factor structure differed considerably from that reported in the test manual. Furthermore, the CDI contains items, such as difficulty with school work, reduced academic performance, fighting, misbehavior, and disobedience, that are not criterion for depression in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (American Psychiatric Association 1994).

Determining the effect of depression measures is important for at least two reasons. First, different depression measures tap different aspects of depression. Second, Sweeney et al. (1986) examined the moderating effect of depression measure but obtained inconsistent findings.

Delay Between Assessments

Time interval between waves of data collection may be negatively associated with the relation between attributional style and subsequent depression. That is, the relationship might be expected to weaken with increasing time between assessments. Most empirical studies adopted a 2-wave design, which prevents examination of the effect of time between waves on the relation between depression and attributional style. One exception was Morris and Tiggemann (1999) that surveyed 363 freshmen at the beginning of the first semester, the beginning of the second semester, and the end of the second semester. Their findings do not support a weakening of the relation between attributional style and depression with increasing time between waves. The correlation between generality score assessed at the beginning of the first semester and depressive symptoms assessed at the beginning of the second semester was .13, while that between generality score assessed at the beginning of the first semester and depressive symptoms assessed at the end of the second semester was .19. The corresponding values for composite score were .20 and .26, respectively. Similar results were found in Nolen-Hoeksema et al. (1986) who used a 4-wave design to examine the relation between attributional style and depressive symptoms for 308 elementary school students. Attributional style and depressive symptoms were assessed in January, March, June, October, and January of the following year. The correlation between prior attributional style and subsequent depressive symptoms did not seem to decrease over time. The effect of delay between waves of data collections also was not supported in Robinson et al. (1995), who examined this relation for a sample of 281 6th graders. The second assessment was conducted 4–5 months after the initial assessment, and was followed 5–6 months later by the third assessment. The correlation between Time 1 negative attributional style and Time 2 depressive symptoms assessed by the CDI was .38, while that between Time 1 attributional style and Time 3 depressive symptoms was .39. As the correlation coefficients were comparable, their findings suggested that the relationship did not weaken with increasing time. Despite the fact most primary research does not seem to support the contention that the relationship weakens with increasing time between assessments, it seemed prudent to include the possible moderator in the current meta-analysis.

Previous Meta-Analyses

The link between attributional style and depression has attracted considerable research interest. Consequently it is unsurprising that three-meta-analyses have examined the relation between attributional style and depression. The first, conducted by Sweeney et al. (1986) included 75 studies from 1976 to 1984. The results showed that the weighted mean correlation between internal attribution of negative outcomes and depression was .21, while that for stable attribution was .20, and that for global attribution was .22, the weighted mean correlation between internal attribution of positive outcomes and depression was −.19, while that for stable attribution for positive outcomes was −.14, and that for global attribution of positive outcomes was −.06. Thus, the first meta-analysis supports that attributions for negative outcomes to internal, stable, and

global causes were positively associated with depression, whereas attributions for positive outcomes to internal, stable, global causes were negatively associated with depression. The associations were small to moderate.

Gladstone and Kaslow (1995) reported a meta-analysis specifically focused on children and adolescents and included 28 studies. The weighted mean correlation between attributional styles and depression was .41 for negative events, while that for positive events was .33, and that for overall composite was .50. Their findings support the relation between attributional style and depression. The main limitation of this meta-analysis was that it included only published studies, and excluded unpublished studies, such as dissertations. Second, the study sample is limited to those dealing solely with children and adolescents, and excludes studies examining the relation between attributional style and depression for adults. Because the weighted mean relations for youths and adults may be different, the selection of children and adolescents may limit the generalizability of results.

Joiner and Wagner (1995) included 27 cross-sectional and seven longitudinal studies published in peer-reviewed journals from 1978 to 1993. The cross-sectional studies found a weighted mean correlation between overall composite and self-reported depression of $r = -.50$, while that between attribution of positive events and self-reported depression was $-.38$, and that between attribution of negative events and self-reported depression was .35. This study included seven longitudinal studies but the weighted mean correlation was not computed. Further, this study involves only samples of children and adolescents, while excluding those focused on adults.

Method

Literature Search

To locate potential studies for inclusion in the sample, extensive searches were undertaken, starting with a search of the ERIC, PsycINFO, and ProQuest Dissertations and Theses Databases using the combination of depression term (depress*), attributional style terms (attribution*, cognitive style*, inferential style*, explanatory style, internal or external), and research design terms (longitudinal, panel, or prospective) to August 2014. This search yielded 1787 PsycINFO hits, 17 ERIC hits, and 234 ProQuest hits. The reference lists for all relevant articles and previous review articles (Jacobs et al. 2008; Joiner and Wagner 1995: Lakdawalla et al. 2007) were subsequently examined for additional studies not identified through computer-based searches. In total, 589 studies were retrieved for further review.

Inclusion criteria were as follows. First, studies that reported at least the correlation between prior attributional style and subsequent depressive symptoms were included. Second, studies measuring general attributional style were included. Meanwhile, studies that examined specific attributional styles, such as attributional style of health problems, interpersonal relationship, employment, or martial problems, were excluded. Third, studies must be published in English.

When studies shared the same sample, that with the longest interval between assessments was selected. When studies possessed the same interval between assessments, that with the largest sample size was selected. Eligible studies are marked with a single asterisk in the reference section.

As mentioned previously, attributional style was defined as an individual's causal explanations of positive and negative events. Specifically, individuals attribute negative or positive events to internal/external, stable/unstable, and general/specific causes. Measures of locus of control usually assess only the dimension of internality/externality and studies focusing only on locus were excluded. Such exclusions included studies by Ginexi et al. (2000) using Rotter's scale (1966), by Margolies (1989) using Nowicki and Strickland's scale (1973), and by Langan-Fox et al. (2009) using Levenson's scale (1973). Furthermore, studies that used measures consisting of items other than attributional style were excluded. For example, the Adolescent Cognitive Style Questionnaire (ACSQ, Hankin and Abramson 2002) measured the causes and the likelihood of consequences of an event. Hence, the study by Bohon et al. (2008) was excluded. Similarly, the study of Mezulis et al. (2014), which used the Children's Cognitive Questionnaire (Mezulis et al. 2006), was also excluded. The CSQ (Haeffel et al. 2008) measured the cause of an event, as well as its consequences, and implications for self-worth. Hence, Cogswell et al. (2006) used the CSQ and therefore this study was excluded. On the other hand, the studies by Kleiman et al. (2012), Pössel and Thomas (2011), and Stone et al. (2010), all of which used the CSQ and reported the correlation between causes of events and subsequent depressive symptoms, were included.

Coding

The following variables were coded: (a) sample size, (b) correlation between attributional style and subsequent depressive symptoms, (c) publication status, (d) attributional style measure, (e) depression measure, (f) mean ages at assessments, (g) time interval between assessments, (h) participant gender: the proportion of males, and (i) participant ethnicity: the proportion of Caucasians. To ensure accuracy all included studies were coded by the

author on two occasions separated by an approximately 2-month interval. For continuous variables, all correlation coefficients between data coded on two occasions were greater than .87. For categorical moderators, the percentages of agreement across all codes exceeded 91 %.

Analysis

The present meta-analysis used two effect sizes. The first effect size was the Pearson product-moment correlation. However, the correlation suffers from some undesirable statistical problems, such as non-constant variance (Rosenthal 1994), yet the inverse variance was usually used as a weight to compute the mean correlation. To address this issue, the correlation coefficient (r) between attributional style and subsequent depressive symptoms was converted to Z_r. $N - 3$ was used as a weight to compute weighted correlation coefficients.

To estimate the effect of prior attributional style on subsequent depressive symptoms when controlling for prior depressive symptoms, both prior attributional style and prior depressive symptoms were entered into the regression model as predictors of subsequent depressive symptoms (e.g., $\hat{Z}_{D2} = \beta_1 Z_{AS1} + \beta_2 Z_{D1}$ in equation forms). β_1 served as an effect size to examine the effect of prior attributional style on subsequent depressive symptoms when controlling for prior depressive symptoms. Sample size was used as a weight to compute the mean effect.

Most included studies used higher attributional style score to indicate higher pessimistic or negative attributional style while others used higher attributional style score to indicate higher positive attributional style. To compute mean correlation across studies, the direction of the correlation between positive attributional style and subsequent depressive symptoms was reversed. Consequently, a positive correlation indicated higher depressogenic attributional style associated with relatively high level of depressive symptoms.

The fixed-effects model assumes that the true effect size is identical in all studies. The observed effect size varies because of the sampling error. In the random-effects model, studies may have different true effect sizes. Both the within-study (sampling error) and between-study (variation of true effect size across studies) variances were used to explain the variation of effect size in the random-effects model. As the assumption of the fixed-effects model is implausible, the random-effects model was adopted in the current meta-analysis.

Independence

To estimate the weighted mean correlations between attributional style scales and subsequent depressive symptoms, all correlation coefficients between attributional style scales and subsequent depressive symptoms were coded. For example, if the correlation coefficients of the internality, stability, globality scales with subsequent depressive symptoms, as well as the correlation between composite score of these three scales and subsequent depressive symptoms were provided in the sample, then four different correlation coefficients were coded (namely for the correlations between internality and subsequent depressive symptoms, stability and subsequent depressive symptoms, globality and subsequent depressive symptoms, and composite score and subsequent depressive symptoms). The independence issue arises when multiple scales of attributional style were derived from a sample. In analysis of the mean correlation between attributional style scales and subsequent depressive symptoms, the correlation coefficients for various attributional style scales were considered independent. For the examination of moderator effects, the correlation between overall composite (composite score of internality, globality, and stability) and subsequent depressive symptoms was selected when available. When the overall composite was not available while the generality scale (composite score of globality and stability) was available, the correlation between generality score and subsequent depressive symptoms was selected. When composite score and generality scale were not available, the mean correlation across subscales was computed.

Results

Description of Included Studies

The meta-analysis included 12,594 participants analyzed in 52 studies that reported correlation between attributional style and subsequent depressive symptoms. Of the 52 studies, 40 were journal articles, ten were dissertations, and two were theses. Table 1 presents sample size, mean age at the first assessment, proportion of males, proportion of Caucasians, time between assessments in years, measures of attributional style and depressive symptoms, correlation between attributional style and subsequent depressive symptoms, and standardized regression coefficient. Three studies had two samples and one study had three samples, yielding 57 independent samples. The mean sample size was 221.12 participants (range 20–1507 participants). The mean age was available for 55 samples, and across these 55 samples the mean age was 18.06 years old (range 8.20–43.07 years old). Of the 57 samples, the proportion of males was available in 48 samples. Four samples were male only, four were female only, and 40 were mixed gender.

Table 1 Studies of the relation between attributional style and subsequent depressive symptoms

Study	N	Age	p. of male	p. of White	Interval	AS measure	D measure	r_{as1d2}	β
Abela et al. (2009)	342	14.13	.22	.85	.12	CASQ	CDI	(N,GS) = .54	.18
Abela and Payne (2003)	314	11.14	.55	.65	.12	CASQ	CDI	(N,GS) = .37	.15
Abela and Sarin (2002)	79	12.25	.20	.97	.19	CASQ	CDI	(N,GS) = .36	.19
Alvarado (1988)	109	19.50	.36	NA	.12	CAS	BDI	(N,I) = .15; (N,S) = .18; (N,G) = .19	NA
Asdigian (1993)	247	19.50	.38	NA	.06	EASQ	BDI	(N,GS) = .31	.10
Bramlette (1998)	115	19.30	NA	NA	.04	EASQ	BDI	(N,GS) = .43	.18
Brozina and Abela (2006)	418	10.50	.47	.64	.12	CASQ	CDI	(N,GS) = .37	.13
Cole et al. (2011)	100	8.51	.51	.25	2.50	CASI	CDI and CDRS	(N,IGS) = .08	NA
Conley et al. (2001)	130	8.20	NA	.99	.62	CASI, CASQ-R	CDI	(N,GS) = .14; (N,IGS) = .10; (P,GS) = .27; (P,IGS) = .32; (B,IGS) = .30; (N,GS) = .34 (N,IGS) = .34, (P,GS) = .36, (P,IGS) = .36; (B,IGS) = .42;	.11
Daniels (1999)	38	43.07	.30	.95	.25	Peterson	HDRS	(N,NA) = .13	.07
Edelman et al. (1994)	94	19.50	.34	NA	.06	EASQ	BDI	(P,GS) = 0; (P,I) = .02	−.06
Frantom (1994)	71	21.60	.35	NA	.12	EASQ	BDI	(N,IGS) = .24	.07
Gibb and Abela (2008), #1	105	9.82	.49	.84	1	CASQ	CDI	(N,GS) = .03	−.16
Gibb and Abela (2008), #2	106	12.27	.19	.90	2	CASQ	CDI	(N,GS) = .28	.18
Gibb et al. (2006)	417	9.77	.42	.24	.49	CASQ-R	CDI	(B,IGS) = .35	.06
Gibb et al. (2012)	100	9.97	.41	.82	.50	CASQ	CDI	(N,GS) = .31	.03
Grazioli and Terry (2000)	57	28.81	0	NA	.12	REASQ	EPDS	(N,I) = .08	.07
Guerry (2008)	101	13.51	.28	.75	1.50	CASQ-R	CDI	(B,IGS) = .46	.21
Hamilton (1982), #1	20	36.60	NA	NA	.05	ASQ	BDI	(N,NA) = −.09; (P,NA) = .01	−.04
Hamilton (1982), #2	20	NA	NA	NA	.05	ASQ	BDI	(N,NA) = .01; (P,NA) = .19	−.02
Hamilton (1982), #3	20	NA	NA	NA	.05	ASQ	BDI	(N,NA) = −.19; (P,NA) = −.06	−.17
Han (1995)	62	37	.24	.77	.07	ESASQ and PAQ	BDI	(P,GS) = .22	.08
Hankin et al. (2001), #1	153	16.18	0	.86	.10	CASQ	BDI	(N,IGS) = .48; (N,GS) = .45	.17
Hankin et al. (2001), #2	117	16.18	1	.86	.10	CASQ	BDI	(N,IGS) = .42; (N,GS) = .41	.23
Hilsman and Garber (1995)	414	11.39	.42	.65	.03	CASQ	CES-DC	(N,IGS) = .18	.04
Johnson (1992)	100	19.50	.40	NA	.08	EASQ	SCL-90	(N,GS) = .30	NA
Johnson and Miller (1990)	80	19.50	.45	NA	.08	ASQ	BDI	(N,IGS) = .18	.04
Joiner (2000)	34	14.33	.37	.76	.17	CASQ	CDI	(N,GS) = .07	−.29
Kleim et al. (2012)	183	35.14	.67	.60	.46	Kleim	BDI	(N,I) = .42; (N,S) = .45; (N,G) = .48	NA
Kleiman et al. (2012)	209	20.51	.16	.54	.07	CSQ	BDI-II	(B,GS) = .05	−.05

Table 1 continued

Study	N	Age	p. of male	p. of White	Interval	AS measure	D measure	r_{as1d2}	β
Kouros et al. (2013)	240	11.86	.46	.82	6	CASQ	CDI	(B,GS) = .17	.04
Kuperman (1991)	63	41	.98	.75	.12	ASQ	BDI	(B,IGS) = .30	.15
Lewinsohn et al. (2001)	1507	16.60	.46	.91	1.15	CASQ	K-SADS	(N,GS) = .06	NA
Martin (1986)	305	19.61	.51	NA	.17	ASQ	BDI	(P,I) = .15; (N,I) = .15; (B,I) = .02; (P,S) = .07; (N,S) = .20; (B,S) = .10; (P,G) = 0; (N,G) = .12; (B,G) = .08	NA
McCarty et al. (2007)	331	12	.53	.56	1	CASQ-R	MFQ	(N,IGS) = .27	.10
McQuade et al. (2011)	88	9.60	1	.86	2.50	CASQ-R	CDI	(N,IGS) = .25; (P,IGS) = .23	.02
Metalsky and Joiner (1992)	152	19.50	NA	NA	.10	EASQ	BDI	(N,GS) = .33	.10
Morris and Tiggemann (1999)	247	22.04	.31	NA	.83	ASQ	BDI	(N,GS) = .19; (N,IGS) = .26	NA
Nolen-Hoeksema et al. (1986)	168	9	.52	NA	1	CASQ	CDI	(B,IGS) = .31	.15
O'Donnell et al. (2010)	88	10.74	.41	.35	2	CASQ-R	CDI	(B,IGS) = .42	.05
Panak and Garber (1992)	521	9	.46	.71	.92	CASQ	CDI	(B,IGS) = .34	.15
Pomerantz (2001)	806	11.69	.49	.96	.50	CASQ	CES-DC	(B,IGS) = .33	.12
Pössel and Thomas (2011)	311	23.27	.20	NA	.15	CSQ	CES-D	(N,G) = .31; (N,S) = .19	.11
Priester and Clum (1992)	269	19.50	NA	NA	.03	ASQ	BDI	(P,I) = .38; (P,S) = .28; (P,G) = .24; (N,I) = .26; (N,S) = .28; (N,G) = .34;	NA
Prinstein and Aikins (2004)	158	16.31	.39	.80	.42	CASQ-R	CDI	(B,IGS) = .57	.23
Quevedo (2008)	170	11	NA	NA	5.75	CASQ	K-SADS, CBCL-Y, CBCL-T	(B,IGS) = .05	NA
Reilly et al. (2012)	140	19.50	.23	NA	.11	ASQ	BDI-II and CES-D	(N,IGS) = .22	.04
Robinson et al. (1995)	239	12	.42	.74	.83	CASQ	CDI	(N,IGS) = .39	.15
Rueger and Malecki (2011), #1	257	13.20	0	.55	.33	CASI	CES-DC	(N,GS) = .24	.10
Rueger and Malecki (2011), #2	241	13.20	1	.55	.33	CASI	CES-DC	(N,GS) = .18	.05
Sanjuán and Magallares (2009)	101	37.01	0	NA	.13	ASQ	BDI	(N,IGS) = .28	.14
Southall and Roberts (2002)	115	16.50	.50	.98	.27	CASQ	BDI	(N,IGS) = .30	.09
Spence et al. (2002)	733	12.91	.54	NA	1	CASQ	BDI	(B,IGS) = .30	.13
Stevens and Prinstein (2005)	398	12.70	.52	.87	.92	CASQ-R	CDI	(B,IGS) = .44	.10
Stone et al. (2010)	417	18.14	.38	.66	.50	CSQ	BDI-II	(N,GS) = .40	.12
Syzdek and Addis (2010)	62	38	1	.47	.25	ASQ	BDI-II	(N,GS) = .22	.06

Table 1 continued

Study	N	Age	p. of male	p. of White	Interval	AS measure	D measure	r_{as1d2}	β
Williams (1988)	122	19.80	NA	NA	1	ASQ	BDI	(N,I) = .19; (N,S) = .04; (N,G) = .18; (N,IGS) = .19	NA

β was the standardized regression coefficient that served as an effect size to examine the effect of prior attributional style on subsequent depressive symptoms when controlling for prior depressive symptoms

The correlations between prior attributional style and subsequent depressive symptoms were given a label that identifies the event (N = negative events; P = positive events; B = both positive and negative events) and subscale (I = Internality; G = Globality; S = Stability; NA = not available). The direction of the correlation between positive attributional style and subsequent depressive symptoms was reversed. Hence, a positive correlation indicated higher depressogenic attributional style associated with relatively high level of depressive symptoms

Age = mean age at the first administration; p. of male = proportion of males; p. of White = proportion of Caucasians; interval = time interval between first and last assessments in years; AS Measure = the attributional style measure, EASQ = the Extended Attributional Style Questionnaire, Peterson = Peterson and Villanova (1988), CASQ = the Children's Attributional Style Questionnaire, CAS = the Causal Attribution Scale, CASI = the Children's Attributional Style Interview, CSQ = the Cognitive Style Questionnaire, CASQ-R = the Children's Attributional Style Questionnaire-Revised, REASQ = the Real Events Attributional Style Questionnaire, ASQ = the Attributional Style Questionnaire, PAQ = the Particular Attributions Questionnaire, Kleim = Kleim et al. (2012); D measure = the depression measure, CDI = the Children's Depression Inventory, BDI = the Beck Depression Inventory, CDRS = the Child Depression Rating Scale, HDRS = the Hamilton Depression Rating Scale, EDPS = the Edinburgh Postnatal Depression Scale, CES-DC = the Center for Epidemiological Studies Depression Scale for Children, SCL-90 = the Hopkins Symptom Check List Checklist, BDI-II = the Beck Depression Inventory-II, K-SADS = the Schedule for Affective Disorders and Schizophrenia, MFQ = the Mood and Feelings Questionnaire, CES-D = the Center for Epidemiology Studies Depression Scale, CBCL-Y = the Child Behavior Checklist-Youth Self-Report, CBCL-T = the Child Behavior Checklist-Teacher Report Form; r_{as1d2} = the correlation between prior attributional style and subsequent depressive symptoms

Weighted Mean Correlation Between Attributional Style and Subsequent Depressive Symptoms

Coding attributions respectively for positive and negative events for various scales from the same sample yielded 95 correlation coefficients. Table 2 lists the weighted mean correlations between attributional style scales and subsequent depressive symptoms. Funnel plots were used to examine the possible publication bias for effect sizes with at least ten data points (i.e., composite score for negative events, generality score for negative events, and composite score for both negative and positive events). All three plots did not conform to a funnel shape and was not symmetric. To measure funnel asymmetry, Egger's tests (Egger et al. 1997) were used. All three tests were not significant, indicating that there was no statistical significant evidence of publication bias. The non-significance of Egger's tests can be due to the lack of statistical power.

For studies examining attributions of negative events, the scales used were not specified in four effect sizes. For remaining scales, the weighted mean correlation coefficients ranged from .22 to .30, representing a moderate effect based on the guidelines of Cohen (1988). These relations significantly differed from 0 in that the 95 % confidence interval excluded 0.

The number of data points for positive events was small compared to those for negative events. Most weighted mean correlation coefficients did not differ significantly from 0, probably due to small number of samples.

For effect sizes using both positive and negative events, the subscales of internality, globality, and stability each had one effect size and thus the weighted mean correlation coefficients were not computed for these three subscales. The weighted mean correlation between overall composite score and subsequent depressive symptoms was moderate at $r = .35$, while that between generality and subsequent depressive symptoms was small $r = .11$.

Weighted Mean Standardized Regression Coefficient

To examine the effect of prior attributional style on subsequent depressive symptoms when controlling for prior depressive symptoms, the correlations between prior attributional style and subsequent depressive symptoms, between prior depressive symptoms and subsequent depressive symptoms, and between prior attributional style and prior depressive symptoms were required. These correlation coefficients were reported in 47 of the 57 independent samples. The dimension of attributional style measured in these 47 samples included overall composite, generality, internality, globality, and stability. The sample-size-weighted mean β_1 was .10. Thus, the expected increase in subsequent depressive symptoms for every 1 standard deviation increase in prior negative attributional style was .10 standard deviations when controlling for prior depressive symptoms. That is, the overall effect of prior depressogenic attributional style on subsequent depressive symptoms was $\beta_1 = .10$ in individuals with similar severity of prior depressive symptoms. Prior negative attributional style thus had only a small effect on subsequent depressive symptoms when controlling for initial depressive symptoms.

Table 2 Summary of meta-analysis results for relation between attributional style and subsequent depressive symptoms

	k	$\bar{r}$	95 % CI		Q_T	p	I^2
			Lower	Upper			
Negative event							
Overall composite	16	.27	.21	.33	14.93	.46	0
Generality	22	.30	.22	.37	12.98	.91	0
Internality	6	.22	.09	.35	4.92	.43	0
Globality	6	.28	.13	.41	4.97	.42	0
Stability	6	.23	.10	.36	5.85	.32	0
NA	4	−.00	−.33	.33	1.37	.71	0
Positive event							
Overall composite	3	.31	.09	.51	1.04	.59	0
Generality	4	.22	−.03	.45	2.92	.40	0
Internality	3	.20	−.25	.58	2.12	.35	0
Globality	2	.12	−.89	.93	1.00	.32	0
Stability	2	.18	−.84	.92	1.00	.32	0
NA	3	.05	−.50	.57	.58	.75	0
Positive and negative events							
Overall composite	13	.35	.29	.41	15.88	.20	.18
Generality	2	.11	−.51	.71	1.00	.32	0

The direction of the correlation between positive attributional style and subsequent depression was reversed. A positive correlation indicated higher negative attributional style associated with high depression

NA = not available; k = total number of correlations included in the analysis; Q_T = Cochran's Q test statistic with $k - 1$ degrees of freedom

Moderator Analyses of Relations Between Attributional Style and Subsequent Depressive Symptoms

Publication Status

To identify any potential association between publication status and the relation between attributional style and subsequent depressive symptoms, separate weighted means were computed for journal and unpublished articles. As shown in Table 3, the effect of publication status was not statistically significant. The weighted mean correlation was .29 for journal articles and .21 for unpublished articles.

Attributional Style Measure

Various attributional style measures used in the primary studies had only one sample and thus their weighted means were not computed. The weighted mean correlation coefficients were computed for attributional style measures with multiple data points. The weighted mean correlations for the CASQ, EASQ, CASQ-R, and ASQ differed significantly from 0. On the other hand, the CASI (Conley et al. 2001; Haines et al. 2005) and CSQ (Abramson et al. 2000) each had three samples and the weighted mean correlation coefficients did not significantly differ from 0. Since the Q_B statistic was not significant, the attributional style measure was not associated with the relation between attributional style and subsequent depressive symptoms.

Depression Measure

Twenty-two samples used the BDI (Beck et al. 1961), 19 used the CDI (Kovacs 1992), four used the Center for Epidemiological Studies Depression Scale for Children (CES-DC, Weissman et al. 1980), and three used the BDI. The weighted mean correlations for these measures were about moderate. The depression measure was not related to the relation between attributional style and subsequent depressive symptoms, with $Q_B = 6.77$ ($p = .08$).

Delay Between Assessments

The time interval between assessments was divided into two groups: (a) long-term studies with an interval of at least 1 year; and (b) short term studies with an interval of <1 year. Forty-three samples adopted the short-term design, while 14 samples adopted the long-term design. As shown in Table 3, the between-groups homogeneity statistic was not significant, $Q_B = .82$, $p = .37$. The weighted mean correlation for short-term studies was $r = .29$ and that for long-term studies was $r = .25$. Table 4

Table 3 Moderator analyses for the relations between attributional style and subsequent depressive symptoms

Moderator	*k*	$\bar{r}$	95 % CI		Q_B	*df*	*p*
			Lower	Upper			
Publication Status					2.43	1	.12
Published	43	.29	.25	.34			
Unpublished	14	.21	.11	.31			
AS Measure					9.91	5	.08
CASQ	20	.29	.23	.36			
EASQ	6	.28	.11	.43			
CASI	3	.17	−.21	.51			
CASQ-R	7	.40	.27	.51			
ASQ	12	.20	.09	.30			
CSQ	3	.23	−.14	.54			
D measure					6.77	3	.08
CDI	19	.36	.30	.41			
BDI	21	.27	.21	.33			
CES-DC	4	.24	.05	.41			
BDI-II	3	.24	−.09	.53			
Interval					.82	1	.37
Short-term	43	.29	.24	.33			
Long-term	14	.25	.16	.33			
Age					3.00	1	.08
Adults	24	.24	.17	.30			
Youths	31	.31	.26	.36			
Gender					.07	1	.79
Female	4	.29	.06	.50			
Male	4	.27	.03	.48			

k = total number of correlations included in the analysis; Q_B = Cochran's Q test statistic; AS measure = attributional style measure, CASQ = the Children's Attributional Style Questionnaire, EASQ = the Extended Attributional Style Questionnaire, CASI = CASI = the Children's Attributional Style Interview, CASQ-R = the Children's Attributional Style Questionnaire-Revised, ASQ = the Attributional Style Questionnaire, CSQ = the Cognitive Style Questionnaire; D measure = depression measure, CDI = the Children's Depression Inventory, BDI = the Beck Depression Inventory, CES-DC = the Center for Epidemiological Studies Depression Scale for Children, BDI-II = the Beck Depression Inventory-II

* $p < .05$

presents the effects of continuous moderators on the relation between attributional style and subsequent depressive symptoms. As shown in Table 4, the effect of time interval, as represented by *b* (−.02), was not significant.

Participant Age

The mean age of the samples was classified into two groups: youths (<18 years) and adults (18 years and over). Twenty-four samples were from adults and 31 from youths. As shown in Table 3, the between-groups homogeneity statistic was marginally significant, $Q_B = 3.00$, $p = .08$. The weighted mean correlation for adults was close to moderate at $r = .24$, while that for youth was moderate ($r = .31$). As the weighted mean correlation appeared to decrease with age, weighted regression analysis using age as a continuous variable was employed for the hypothesis testing. Mean age at study inception was not associated with the correlation between attributional style and subsequent depressive symptoms.

Participant Gender

Some studies reported the relation between attributional style and subsequent depressive symptoms specifically for female and/or male participants. The weighted mean correlations were computed for both the female- and male-only samples. As shown in Table 3, there were four samples each for both male and female groups. The weighted mean correlations for both genders were comparable and the effect of gender was not significant. The proportion of males was available in 48 samples, and this effect was explored. As shown in Table 4, this effect was once again not significant.

Ethnicity

The proportion of Caucasians was available in 32 samples. The effect of the proportion of Caucasians ($b = .11$) was not significant. This finding indicates that the proportion of Caucasians was not related to the correlation between attributional style and subsequent depressive symptoms.

Discussion

Although previous meta-analyses (Gladstone and Kaslow 1995; Joiner and Wagner 1995; Sweeney et al. 1986) have reported the link between attributional style and depressive symptoms, temporal predominance was not established. Estimating the relation between attribution style and subsequent depressive symptoms based on longitudinal studies has implications for reducing depressive symptoms. If prior negative attributional style is associated with subsequent

Table 4 Effects of continuous moderators on the relations between attributional style and subsequent depressive symptoms

Variable	*k*	*b*	*p*
Time interval	57	−.02	.26
Age	55	−.00	.33
Proportion of males	48	.00	.97
Proportion of Caucasians	32	.11	.48

k = total number of correlations included in the analysis

depressive symptoms, the formation of positive explanatory style can be a way to overcome depressive symptoms.

Most studies examined the relation between attributional style of negative events and subsequent depressive symptoms, while some studies focused on attributions of both positive and negative outcomes, and only a few investigated attributions of positive events. Studies focusing on negative events found a moderate relation between pessimistic attributional style and subsequent depressive symptoms, similar to the magnitudes for negative events found by Sweeney et al. (1986). On the other hand, the weighted mean correlations found in the present study were smaller than those found in Gladstone and Kaslow (1995) and Joiner and Wagner (1995).

As the standardized regression coefficient was used as an effect size, the variance of subsequent depressive symptoms that was shared by prior attributional style and prior depressive symptoms was assumed to be attributed to prior depressive symptoms instead of prior attributional style. The weighted mean effect of attributional style on subsequent depressive symptoms controlling for prior depressive symptoms was small ($\beta = .10$). Attributional style may not be a good target for intervention, since the longitudinal effect was weak.

Some meta-analyses have examined the effect of prior correlates on subsequent depressive symptoms when controlling for initial depressive symptoms. The weighted mean effect of prior attributional style was comparable to those of correlates on subsequent depressive symptoms. Specifically, the weighted mean effect of prior academic achievement on subsequent depressive symptoms was $\beta = -.06$ in Huang (2013), while that of prior self-esteem on subsequent depressive symptoms was $\beta = -.16$ in Sowislo and Orth (2013) when controlling for prior depression.

Previous meta-analyses (Gladstone and Kaslow 1995; Joiner and Wagner 1995; Sweeney et al. 1986) did not examine the effects of demographic variables on the relation between attributional style and depression. The effects of participant age, gender, and ethnicity were weak in the present study. The moderating effects of depression and attributional style measures were not significant. However, the weighted mean correlations for various attributional style measures ranged from .17 to .40. Most attributional style measures involved a small sample number. As the findings regarding attributional style measure were not robust, future research should address this issue. The effect of time interval between assessments was not significant. Most of the 57 studies sampled adopted a short-term design and 14 had time intervals of 1 year or more. The weighted mean correlation for short-term studies ($r = .29$) was comparable to that for long-term studies ($r = .25$). This finding indicates that learned helplessness depression was constant across time. In sum, the moderator effects were minor in the present study.

This study has some limitations. First, the effect of sample type was not examined since most samples were from the general population and few studies were based on clinical or high-risk samples. Second, this study did not examine the effect of type of outcome since 55 samples used hypothetical events and only two used real-life events. Future research should investigate these possible moderating effects. Third, the proportion of meta-analyzable studies among the identified studies was low. Most identified studies were excluded due to missing effect sizes. Hence, reporting bias may threaten the validity of research findings in the current meta-analysis. Lastly, moderator analyses were conducted with group-level variables and caution was noted for the risk of ecological fallacy. In other words, the relation across studies may not apply to that within study.

Conflict of Interest Chiungjung Huang declares no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (national and institutional). Informed consent was obtained from all individual subjects participating in the study.

Human and Animal Rights This article does not contain any studies with human participants performed by any of the authors and no animals have been used.

Appendix

See Figs. 1, 2, 3 and 4.

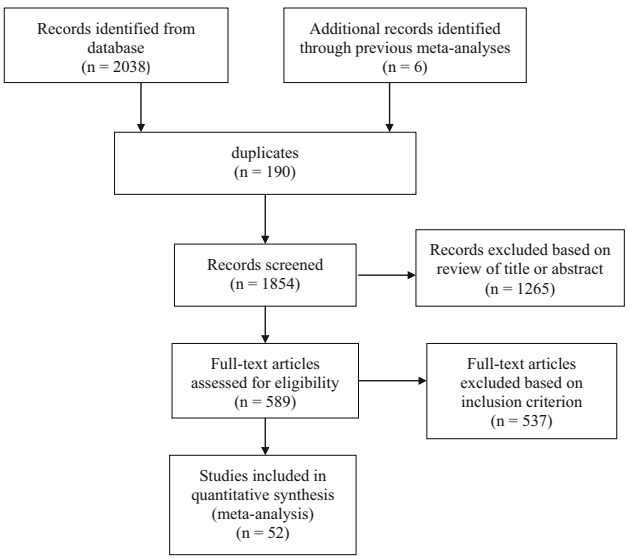

Fig. 1 Study selection flowchart

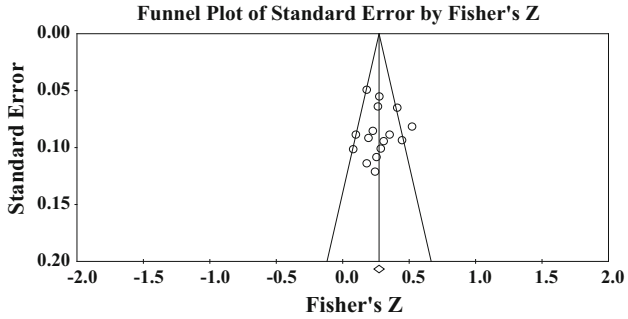

Fig. 2 *Funnel plot* for overall composite score for negative events

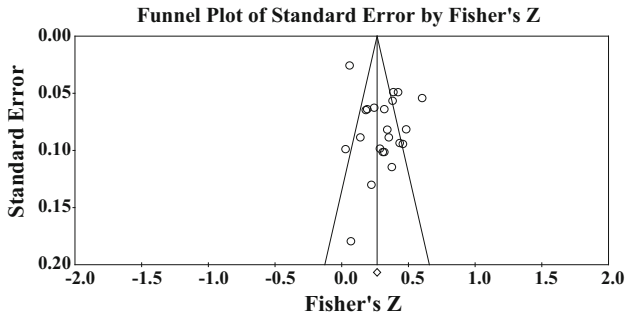

Fig. 3 *Funnel plot* for generality score for negative events

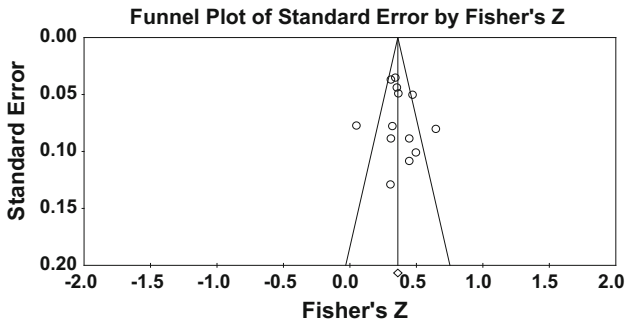

Fig. 4 Funnel plot for overall composite score for both positive and negative events

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