

Implicit theories and youth mental health problems: A random-effects meta-analysis



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HIGHLIGHTS

- We explored relations between implicit theories and youth mental health problems.
- We used a random-effects meta-analysis and clustered data analysis techniques.
- Youths holding entity theories showed more pronounced mental health problems.
- Findings suggest value of parsing implicit-theory-mental health links in youths.
- Implicit theories may be promising targets for treatment of youth psychopathology.

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ABSTRACT

Compared to youths who believe that personal traits are malleable, those who believe that personal traits are fixed experience more academic and self-regulatory distress. Recently, studies have begun to explore relations between beliefs about the malleability of personal traits, or *implicit theories*, and youth mental health problems. We synthesized this emerging body of research in youths (ages 4–19) across 45 effect sizes from 17 research reports. Studies were included if they assessed youth mental health and implicit theories and did not manipulate implicit theory or affective/behavioral states prior to measuring these variables. Our random-effects meta-analysis using clustered data analysis techniques (i.e., effect sizes nested within samples) revealed that youths holding entity theories—the belief that personal traits are fixed—showed more pronounced mental health problems. This association between entity theories and mental health problems was evident across methodological factors and problem types (internalizing versus externalizing; psychopathology versus general distress). Limitations include the small number of eligible studies, insufficient data to test further demographic moderators, and few longitudinal studies on this topic. Overall, findings support the value of parsing the implicit theory–mental health link in youths. Implicit theories may prove to be promising targets for treatment and prevention of youth mental health problems.

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1. Introduction

Mental health problems among children and adolescents (henceforth *youths*) are highly prevalent and costly, both to families and society as a whole (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Romeo, Knapp, & Scott, 2006). The World Health Organization estimates that four million youths in the United States suffer a serious mental disorder that causes a significant impairment at home, at school, and with peers; worldwide, over 20% of youths have an emotional or behavioral disorder before 17 years of age (U.S. Department of Health and Human Services, 1999). Identifying factors that predispose or maintain youth mental health problems may help inform prevention and treatment efforts by highlighting potential intervention targets. One potentially relevant factor that has been studied in social and developmental psychology for decades has only recently been examined in relation to youth mental health problems: *implicit theories* are beliefs about one's potential to change personal characteristics. A number of individual studies have focused on the association between implicit theories and youth mental health problems, but to our knowledge the accumulating studies have not been synthesized. We conducted such a synthesis using meta-analytic methods.

According to Dweck and colleagues, individuals' implicit theories form a framework for interpreting and responding to adversity (Dweck, 1999; Dweck & Leggett, 1988; Dweck & Molden, 2006). For instance, the implicit theory that intelligence is a fixed trait (*entity theory*) may lead students to view academic setbacks as signs of their stable low level of intelligence; in contrast, students with the implicit theory that intelligence is malleable (*incremental theory*) may view the same setbacks as opportunities to develop new scholastic skills (Blackwell, Trzesniewski, & Dweck, 2007). Youths' incremental theories of intelligence predict higher exam scores, as well as quicker recoveries from initially poor performance, whereas youths with entity theories score lower on exams and show slower recoveries from scholastic setbacks (Blackwell et al., 2007; Hong, Chiu, Dweck, Lin, & Wan, 1999). Further, incremental theories of intelligence have predicted adolescents' scholastic success over and above conventional intelligence measures, including IQ (Dweck & Sorich, 1999). Thus, "actual" low ability seems not to account for effects of implicit theories on real-world outcomes. Other studies have examined implicit theories of social competence. Erdley, Cain, Loomis, Dumas-Hines, and Dweck (1997) found that youths with entity theories of personality and social competence attributed peer-related setbacks to poor ability, whereas incrementally oriented youths attributed such setbacks to inadequate effort and sought to improve their friendships.

Although many studies have focused on the academic and motivational correlates of implicit theories (Burnette, O'Boyle, Van Epps, Pollack, & Finkel, 2013), fewer have focused on mental health-related correlates. However, there are reasons to predict relations between youths' mental health and their implicit theories. Several models have focused on cognitive vulnerabilities that presage psychopathology. For instance, according to Beck's cognitive vulnerability–stress model of depression (Beck, 1987), dysfunctional attitudes about the self and the world may interact with negative life events to exacerbate depressive symptoms. This model may also help explain the development of youth anxiety and behavior problems (Calvete & Cardeñoso, 2005; Gibb & Coles, 2005). 'Negative events' in this model may include various

life experiences, such as social exclusion, academic stress, or parental conflict. Thus, entity theories of personal traits (e.g. intelligence, person-ality) may serve as a cognitive "vulnerability" to adverse impact of negative life events.

In line with Beck's theory, research suggests that maladaptive cognitions—especially in the context of environmental stressors—are central to the development of youth depression, anxiety, and aggression (Beck, Rush, Shaw, & Emery, 1979; Hale, Van Der Valk, Engels, & Meeus, 2005; Schleider, Vélez, Krause, & Gillham, 2014). For instance, Abramson, Seligman, and Teasdale (1978) proposed that attributing negative life events to unchangeable, global, and internal causes predisposes individuals to mental health problems; empirical studies of community and clinical youth samples support this theory (Abela & Sarin, 2002; Garber & Flynn, 2001; Nolen-Hoeksema, Girgus, & Seligman, 1992). That is, a youth viewing negative events as having stable, internal causes may view a setback—such as a fight with her friend—as resulting from an unchangeable problem with herself that broadly affects her life. This negative bias toward evaluating life events as resulting from stable personal attributes may eventually exacerbate mental health symptoms and disorders. Similarly, youths who hold entity theories of their personal traits—i.e., beliefs that they cannot become smarter, less angry, or more socially skilled—may feel unable to control unwanted life events, and thus be more vulnerable to anxiety, depression, or aggression. Therefore, entity theories of personal traits may set the stage for youth mental health problems.

Conversely, incremental theories about personal traits might protect youths from developing mental health problems. Rather than feeling helpless to change their circumstances, youths who view their personal traits as malleable might believe that they can actively improve their future outcomes through targeted efforts. Indeed, cross-sectional and longitudinal studies suggest that youths with higher perceived self-efficacy—the belief in one's ability to manage and control life events—have lower levels of anxiety, depression, and aggression over time than youths who are lower in self-efficacy (Gaudiano, Miller, & Herbert, 2007; Kokkinos & Kipritsi, 2012; Tonge et al., 2005). Youths with incremental theories about their traits might have relatively high self-efficacy regarding their ability to alter their traits, and in turn cope with adversity. These implicit theories may buffer against psychological distress, and perhaps provide a rationale for increased effort to reverse setbacks through personal improvement.

Overall, findings from Beck's cognitive model and Dweck's achievement motivation theory suggest a possible model linking implicit theories to youth mental health. Specifically, implicit theories may moderate the impact of negative life events on youths' mental health outcomes, such that youths with incremental theories might have more positive symptom trajectories than youths with entity theories, following such events. Indeed, in a recent meta-analysis examining links between implicit theories, self-regulation, and goal achievement in adults, incremental theories predicted more adaptive self-regulatory outcomes during unwanted or adverse experiences (Burnette et al., 2013). In a similar fashion, youths with incremental theories, compared to youths with entity theories, might be expected to respond more adaptively in terms of their mental health outcomes to negative circumstances. Youths who believe their traits can change may remain optimistic in the face of setbacks; indeed, it has been suggested that these youths may exhibit improved self-regulatory abilities *especially* when faced

with adversity (Burnette et al., 2013). Whereas youths with incremental theories may strive to *strengthen* their abilities when faced with goal-inconsistent outcomes, youth entity theorists may fear such outcomes, viewing them as evidence of an irreversible *lack* of ability. Similarly, when faced with adversity, youths with entity theories may be less able to self-regulate thoughts, feelings, and behaviors, and more likely to grow hopeless about their ability to change. Together, these vulnerabilities may increase risk for a wide array of psychopathology, encompassing both internalizing and externalizing problems, depending on youths' temperament and baseline susceptibility (Beck et al., 1979; Nolen-Hoeksema et al., 1992). A study by Rudolph (2010) supports this model: findings from this study suggested that early adolescents who endorsed an entity theory of personality were more likely than those endorsing an incremental theory to demonstrate depressive and aggressive symptoms when victimized by peers. However, Burnette and colleagues did not explore links between implicit theories and psychopathology, leaving this relation unexplored via meta-analytic methods.

Several studies have examined relations between implicit theories and mental health problems in youth. Many of these studies have found strong associations between greater youth mental health problems and stronger entity theories (e.g. King, McInerney, & Watkins, 2012; Yeager, Miu, Powers, & Dweck, 2013), although some have found little to no relation between these variables. For instance, Da Fonseca et al. (2008) found an association of $r = .07$ between entity theories and anxiety in early-to-middle adolescents. Despite variability in the literature, to our knowledge, there has not yet been a quantitative review of the accumulated evidence on this association. To fill this gap, we searched and synthesized the relevant evidence, carrying out a meta-analysis on relations between entity theories and mental health problems¹ Distinct from Burnette et al. (2013) meta-analysis, which aimed to identify *theoretical conditions* of the link between implicit theories and self-regulation, the present study is focused on *youth mental health outcomes* associated with implicit theories. We defined “mental health problems,” broadly, as symptoms of internalizing (e.g., anxiety, depression) or externalizing (e.g., aggression, conduct disorder) dysfunction. We expected that youths who strongly endorsed entity theories would report higher levels of mental health problems than youths who did not.

A second aim was to assess several candidate moderators of the proposed relation between implicit theories and youth mental health problems: youth mental health problem type (internalizing vs externalizing; psychopathology versus general distress), implicit theory domain (intelligence, personality, peer relationships), studies' methodological rigor, and study publication status.² Each candidate moderator is discussed in detail below.

The first candidate moderator was *type of youth mental health problem*—specifically, internalizing versus externalizing. There is evidence to suggest that youths who feel that they have little control over their thoughts, feelings, or environment are at increased risk of developing anxiety and depression (Chorpita & Barlow, 1998; Seligman & Ollendick, 1998; Weisz, Southam-Gerow, & McCarty, 2001). Perhaps youths who view their character traits as unchangeable are at similarly heightened risk for developing internalizing problems. Further, core aims of Cognitive Behavioral Therapy (CBT), the current treatment of

choice for youth internalizing problems, involve training youths in cognitive restructuring to reduce symptomatology (Weisz & Kazdin, 2010). Accordingly, reducing maladaptive cognitions appears especially pertinent to the amelioration of youth depression and anxiety. Although CBT is also used to treat youth externalizing problems, the most prominent and numerous forms of evidence-based treatment for youth externalizing problems involve management of youth *behavior*, rather than cognitions (see e.g., Eyberg, Nelson, & Boggs, 2008; but see also Lochman, Powell, Whidby, & Fitzgerald, 2006). Thus, cognitive risk factors—including, perhaps, entity theories—might show stronger links to internalizing than externalizing problems in youths. In this study, we expected both kinds of mental health problems to show significant associations with implicit theories; however, we expected stronger relations to emerge between internalizing youth problems and implicit theories.

A second potential moderator of the implicit theory–youth mental health association may be the implicit theory *domain*: that is, implicit theories about peer relationships, intelligence, and personality might differently relate to mental health problems in youths.³ There are reasons to predict that implicit theories across domains might relate to youths' mental health. Studies have suggested that peer victimization or exclusion and academic difficulties are both prevalent and potentially harmful to youths, predicting psychological distress during childhood and adolescence (Bakker, Ormel, Verhulst, & Oldehinkel, 2010; Daniels & Moos, 1990; Hilsman & Garber, 1995; Seligman & Ollendick, 1998; Turner & Cole, 1994). Considering the salience of these kinds of stressors, youths with entity theories of intelligence or peer relationships may carry elevated risk for developing mental health problems. Implicit theories of personality might also influence youth mental health problems: youths who view their personalities as unchangeable may experience distress from a wide variety of setbacks (e.g. a difficult home environment; arguments with friends; academic setbacks; environmental transitions). Although a prior meta-analysis on implicit theories and self-regulatory processes observed no moderation effects by implicit theory domain (Burnette et al., 2013), this meta-analysis did not assess youth-specific effects or links between implicit theories and mental health. Therefore, in this study, we conducted an exploratory moderation test by implicit theory domain, positing no specific hypothesis regarding this association. If found, moderating effects might inform understanding of both the implicit theory–youth mental health link and potential intervention targets.

We also tested moderating effects of studies' methodological rigor. Meta-analyses can result in biased conclusions if less rigorous studies yield biased effect size estimations (Higgins & Altman, 2008). As less methodologically rigorous studies have been found to yield an overestimation of effect sizes (Jüni, Altman, & Egger, 2001; Moher et al., 1998), we tested whether effect sizes differed according to studies' methodological rigor scores (Downs & Black, 1998).

Further, we tested whether entity theories showed stronger links with “true” psychopathology (e.g. symptoms of depression, anxiety, or conduct disorder) than with broader measures of distress (e.g., low self-esteem, negative emotions). Differences in these relations might suggest greater relevance theories to clinical or general youth problems, potentially directing future intervention efforts.

Finally, we tested the moderating effect of publication status. Publication bias is a concern for any meta-analytic review. Because studies that have not been published, often due to negative or null findings, are more difficult to retrieve and less likely to be included in a meta-analysis, an artificially inflated combined effect may occur (Begg,

¹ The present meta-analysis focused on the link between youth mental health and entity (rather than incremental) theories. We chose this approach because the majority of included studies used a single, continuous measure to assess implicit theories. Higher scores on these measures typically indicated an entity theory, whereas lower scores indicated an incremental theory. Thus, data regarding entity and incremental theories largely confounded one another, supporting the utility of focusing on one implicit theory type.

² It is notable that we were unable to assess two potentially important moderators, youth gender and youth developmental period, due to limitations in the studies. Specifically, the developmental periods represented across the studies were not sufficiently diverse to allow for a test of moderation, and although all studies included participants of both genders, separate effect sizes by gender were unavailable.

³ Some researchers have conceptualized implicit self-theories of personality and peer relationships as overlapping constructs (e.g., Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011), whereas others have suggested the two as conceptually distinct (e.g., Rudolph, 2010). Thus, to assess all possible links between different implicit self-theory domains and youth problems, we conceptualized self-theories of personality and peer relationships as distinct in this meta-analysis.

1994; Lipsey & Wilson, 2001; McLeod & Weisz, 2004). Although we requested unpublished work from researchers in the field and included unpublished studies in our meta-analysis, this cannot ensure the absence of publication bias. To address this concern, we tested whether effect sizes differed according to publication status.

2. Method

2.1. Study retrieval and selection

An initial search was conducted using ERIC, PsycINFO, Dissertation Abstracts International, Web of Science, PubMed, and Google Scholar. Search terms included combinations of the keywords *implicit theory*, *entity*, *entity theory*, *incremental*, *incremental theory*, *Dweck*, *fixed*, *growth*, *mindset*, *mental health*, *mental illness*, *symptoms*, *symptomatology*, *psychopathology*, *youth*, *children*, and *adolescents*. Studies were also retrieved through an examination of references cited in other articles, to identify additional articles that may have been overlooked in the original search. Finally, experts in the field were contacted in order to gather additional published and unpublished studies.

The initial search yielded 681 citations, which were reviewed by both the first and second authors. If studies were written in English (including studies conducted internationally) and included a youth sample (under 20 years of age, as indicated by the abstract), full texts were retrieved. Through this process, we retrieved full-text articles for 327 citations potentially relevant to relations between implicit theories and youth mental health. Only studies that met the following five criteria were included: (1) Authors assessed one or more mental health problems in youth using a continuous, quantitative measure; (2) authors assessed an implicit theory in youth using a quantitative, continuous self-report measure

(studies that assessed implicit theories discretely were excluded, as they did not allow us to assess correlations between mental health problems and theories. However, no studies that assessed implicit theory discretely also assessed youth mental health problems; thus, these studies would have been excluded regardless); (3) the study did not involve experimental manipulations or interventions intended to (a) induce a certain kind of implicit theory, or (b) alter the experience of affective/behavioral states prior to the measurement of these variables. However, if such studies assessed theories or mental health construct *prior* to an experimental manipulation, these data were included in the meta-analysis; (4) all participants were above the age of 4 and under the age of 19; (5) the implicit theories measured in the study reflected the same constructs described by Dweck and colleagues (1988, 1995, 2006) and not any other kind of implicit theory. Studies conducted in any country were eligible for inclusion. No non-English articles were identified in this search. This selection procedure yielded a pool of 17 studies (i.e., published articles, dissertations, and unpublished papers) that met inclusion criteria (Fig. 1 shows study inclusion flowchart). All included studies were screened by both the first and second authors, with 8 studies coded by both for reliability assessment (inter-coder reliability for screening criteria ranged from $\kappa = .84$ –1.00). When information needed to code studies or calculate effect sizes was missing from written reports, we contacted study authors to obtain the information.

2.2. Study coding

For all studies, several characteristics were coded: (a) publication status (published or unpublished); (b) mean age of participants; (c) sample size; (d) percent male; (e) ethnicity; (f) mental health domain measured (internalizing or externalizing; see Appendix A for an

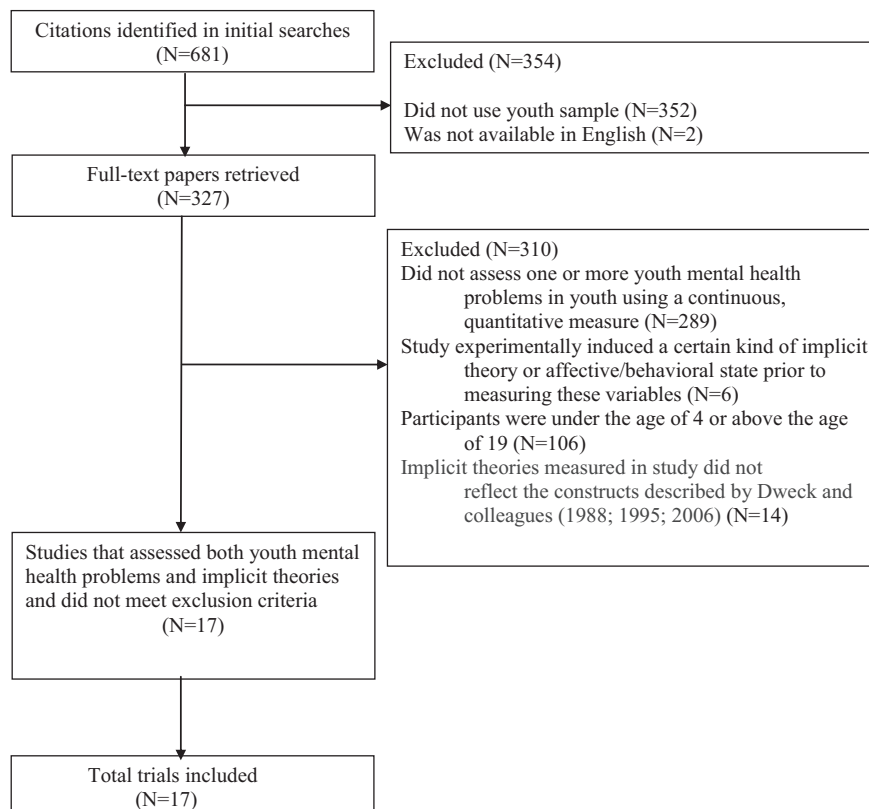


Fig. 1. Flowchart for study identification, screening, and inclusion.

inclusive list of youth problems coded in these categories); (g) whether mental health problem measured was “true” psychopathology (i.e., measured symptoms of a psychiatric disorder) or general distress (e.g., low self-esteem); (h) implicit self-theory domain (personality, intelligence, or peer relationships); (i) unidimensional or continuous implicit self-theory assessment; and (j) zero-order correlation coefficient between implicit self-theory measure and psychopathology measure. Both authors coded all studies for reliability assessment, described above, and showed inter-rater reliability for study variables and effect sizes from $\kappa = .84$ to 1.00. Disagreements were resolved via discussion between the first and second authors.

The quality of each study was coded using seven quality assessment criteria for observational studies (Downs & Black, 1998; Faragher, Cass, & Cooper, 2005; Wong, Cheung, & Hart, 2008). The criteria were as follows: (1) sample representative of population studies (i.e., probability sampling rather than convenience sampling); (2) accurate measurements (i.e., measures have been studied psychometrically and shown to be reliable and valid); (3) adequate response rate (more than 60%); (4) adequate attrition rate (defined by Downs and Black (1998) as less than 40%; this criterion applied to longitudinal studies only and was not included in quality assessment for cross-sectional studies); (5) and adequate sample size (i.e., large enough to detect a small-to-moderate effect size with $\alpha = .05$ and power = .80; an a priori power analysis using the G*Power 3 program was used to determine that a sample size of 193 would be required to detect a small to moderate correlation, $r = .20$, given $\alpha = .05$ and power = .80.). A quality assessment score was computed by dividing the total score (i.e., one point awarded for each relevant item) by the total number of all relevant items and multiplying the quotient by 100 to produce a study quality percentage score (0%–100%). Inter-rater reliability (see procedures, above) for study quality was $\kappa = .89$.

2.3. Statistical analysis

2.3.1. Effect size calculations

Most studies reported Pearson's correlation coefficients (r) to represent the association between implicit theories and youth mental health. One study (Yeager, Miu, et al., 2013) reported results in another metric (unstandardized b coefficients); we transformed these into r using provided t -statistics and sample sizes. Before conducting meta-analyses, correlation coefficients were transformed using Fisher's Z_r transformation, a variance-stabilizing transformation (Rosenthal, 1991). Resulting

Z_r values were transformed back into meta-analytic r coefficients for reporting.

2.3.2. Meta-analytic integration

In this study, 12 of the 17 included reports provided multiple effect sizes from the same participants, violating assumptions of independence in traditional meta-analyses (Lipsey & Wilson, 2001). To use all available data, we used Hedges, Tipton, and Johnson's (2010) technique for analyzing dependent effect sizes. This analysis supported the use of clustered data (effect sizes nested within study samples) by correcting the study standard errors to account for associations between effect sizes from the same sample.

Weighted, random-effects meta-regression models using Hedges et al. (2010) corrections were run with ROBUMETA (Hedberg, 2011) in Stata version 12 to summarize effect sizes and test possible moderators (for details on the models employed in ROBUMETA, see Hedges et al., 2010). Unlike fixed-effects approaches, which assume that there exists one true effect size across studies, random-effects models allow for a distribution of true effect sizes—depending, for example, on levels of moderators. Because we anticipated some degree of between-study variance, the random-effects approach was appropriate for this study (Lipsey & Wilson, 2001). The first model in the meta-analysis was a null meta-regression model estimating only the intercept, which can be interpreted as the overall weighted mean effect size (r). The second model examined moderating effects of mental health problem type (internalizing versus externalizing). The third model examined effects of implicit theory domain (intelligence, personality, or peer relationships). The fourth model tested effects of methodological rigor (measured continuously), and the fifth, of publication status (published versus unpublished).

Although moderator effects can be examined both between and within studies (independent groups of participants), three of four possible moderators (implicit theory domain; methodological rigor; publication status) varied only between studies. Thus, for these variables, between-study effects were assessed. Because mental health problem type varied within samples, we examined moderating effects within samples for this variable.

2.3.2.1. Publication bias. We tested for possible publication bias in two ways. First, we tested study publication status as a moderator of ESs across studies. Second, studies were examined using a funnel plot and Egger's regression test. Funnel plots display studies' ES estimates—in this case, correlation coefficients—in relation to the precision of those

Table 1
Sample characteristics.

Study	Total ES	<i>N</i>	Average age	Percent boys	Mental health problem type	Psychopathology vs. general distress	Publication status	Methodological rigor
1. Ahmavaara and Houston (2007)	1	856	13	49.8	Internalizing, externalizing	General distress	Published	100%
2. Brown (2009)	2	103	4.47	62	Internalizing, externalizing	Psychopathology	Published	75%
3. Chan (2012)	2	251	12.68	56	Internalizing, externalizing	General distress	Published	75%
4. Da Fonseca et al. (2008)	2	28	14.52	50	Internalizing	Psychopathology	Published	80%
5. Da Fonseca et al. (2009)	1	353	13.25	49.5	Internalizing	Psychopathology	Published	100%
6. Gerber and O'Connell (2012)	2	422	15.86	69	Externalizing	Psychopathology	Published	100%
7. King et al. (2012)	5	1147	14.2	54	Internalizing, externalizing	Psychopathology, general distress	Published	75%
8. Lindsay (2006)	2	166	11.5	N/A	Internalizing	Psychopathology, general distress	Unpublished	80%
9. Markovic et al. (2012)	1	175	10.11	53	Internalizing	Psychopathology	Published	75%
10. Michel (2010)	1	275	11.7	52	Internalizing	Psychopathology	Unpublished	100%
11. Mousseau (2011)	4	114	14	39	Internalizing, externalizing	Psychopathology	Unpublished	75%
12. Rudolph (2010)	2	206	10.13	46.6	Internalizing, externalizing	Psychopathology	Published	75%
13. Shih (2009) ^a	2	461	13.5	51	Internalizing	General distress	Published	100%
14. Shih (2011) ^a	3	481	13.42	49	Internalizing	General distress	Published	100%
15. Yeager, Trzesniewski, Tirri, Nokelainen, and Dweck (2011)	1	357	15	49	Internalizing, externalizing	Psychopathology	Published	100%
16. Zhao (2006) ^a	6	46	10.74	54.3	Internalizing, externalizing	Psychopathology, general distress	Unpublished	50%
17. Yeager, Miu, et al. (2013), Yeager, Trzesniewski, et al. (2013)	7	1102	14.5	47.7	Externalizing	General distress	Published	100%

^a Study was conducted in a country other than the United States.

Table 2
Meta-analytic results: Entity theories and youth mental health problems.

Variable	<i>k</i>	Estimate	SE	Test statistic, <i>p</i> -value
Overall mean	17	.25 ^{***}	.03	$t(16) = 8.53, p < .001$
Moderators:				
Mental health problem type				$t(15) = 2.05, p = .06$
Internalizing	13	.30 ^{***}	.06	
Externalizing	6	.18 ^{**}	.05	
Implicit theory domain				$F(2, 14) = 1.25, p = .32$
Intelligence	11	.21 ^{***}	.03	
Peer relationships	6	.24 ^{***}	.06	
Personality	10	.30 ^{**}	.06	
Youth problem type				$t(15) = -.21, p = .84$
Psychopathology	10	.26 ^{***}	.04	
General distress	7	.25 ^{***}	.06	
Methodological rigor				$t(15) = .04, p = .97$
Good (Rigor score: 100%)	14	.25 ^{***}	.04	
Moderate (Rigor score < 100%)	3	.25 [*]	.05	
Publication status				$t(15) = -.60, p = .56$
Published	13	.24 ^{***}	.09	
Unpublished	4	.27 ⁺	.03	

+ $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

estimates (in this case, their standard errors). Results from smaller, less precise studies will scatter widely at the bottom of the graph, with the spread narrowing among larger, more precise studies. In the absence of publication bias, the shape of the plotted points will resemble a symmetrical, inverted funnel (Egger, Smith, Schneider, & Minder, 1997). If there is bias (that is, if the mean effect size is artificially inflated or deflated), funnel plots will appear asymmetrical: plotted points will be skewed toward one side of the funnel. Egger's regression test helps to quantify asymmetry in funnel plots by testing whether ESs in less precise studies (i.e., those with larger variance) differ consistently from ESs in more precise studies.

2.3.2.2. Outlier detection. Consistent with established standards (Huber, 1980; Weiss, 2010), we defined outliers as effect sizes more than three standard deviations from the population coefficient. We found no outliers across all 44 effect sizes analyzed; thus, no data were excluded from final analyses.

3. Results

3.1. Study characteristics

We obtained 44 effect sizes from the 17 studies, two of which reported longitudinal data. See Table 1 for an overview of study characteristics, and Table 2 for results. The studies included 6543 children and adolescents with mean ages ranging from 4.75 to 15.86 years. Mean percent of boys was 51.99%, with 11 studies including more boys than girls. Five study samples were primarily (i.e., 50% and more) Caucasian, whereas one study sample was mostly African American, and one study sample was mostly Latino/a. Nine studies did not report participants' ethnicities.

Approximately half of the studies measured implicit theory of intelligence, and roughly one fourth measured implicit theory of personality, and one fourth, peer relationships. The specific domains of psychopathology were somewhat evenly distributed between internalizing problems and externalizing problems. All studies received methodological rigor scores between 60% and 100%, with a mean of 88.59%. Because a majority of studies received a rigor score of 100%, methodological rigor was treated as a categorical moderator in analyses (100% versus less than 100%). Finally, 14 of the 17 studies were published.

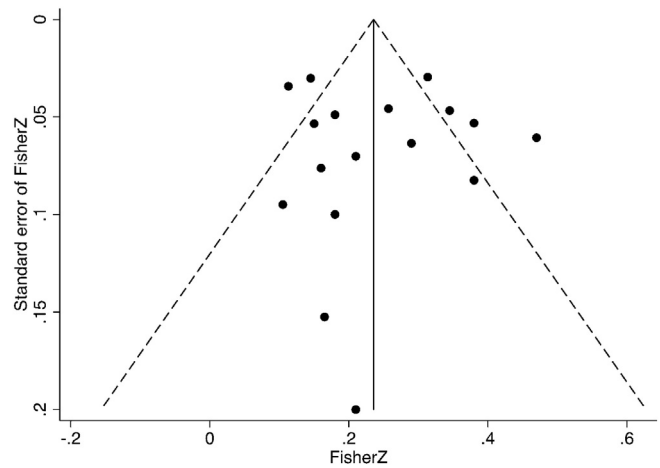


Fig. 2. Funnel plot with 95% confidence intervals (dashed lines). The dots represent each of the 17 studies. The y-axis shows the standard error of each study mean, weighted ES. The x-axis shows the magnitude of each study's mean, weighted ES. Study values are distributed relatively symmetrically around the mean ES (meta-analytic $r = .28$). Slight asymmetry revealed by a significant Egger's regression test appears to be driven by a lack of less precise studies (i.e., studies with higher standard errors) rather than systematic bias.

3.2. Mean effect size analysis

A weighted, random effects meta-regression model tested the association between entity theories and youth mental health across 44 effect sizes. As shown in Table 2, we found a significant correlation of .25 (95% CI = .19, .32, $p < .001$). This equates to an approximately 58% likelihood that a youth with stronger entity theory beliefs will have more severe mental health problems than a youth with weaker entity theory beliefs (Dunlap et al., 1994). Heterogeneity statistics suggested that there was a small but significant amount of between-study variance in the analysis, $Q_{16} = 69.51, p < .001, \tau^2 = .02$. I^2 indicated that 24% of variance observed was true between-study variance. Moderator analyses were conducted as planned; however, given the relatively small amount of heterogeneity observed, moderation findings should be considered exploratory.

3.3. Moderator analyses

We examined mental health problem type as a within-samples moderator. Both youth internalizing and externalizing problems were positively associated with entity theories. This association was marginally stronger for youth internalizing problems (95% CI = .22, .38) than youth externalizing problems (95% CI = .08, .27); for moderation test, $t(15) = 2.05, p = .06$.

Implicit theory domain was assessed as a between-samples moderator. Associations between entity theories and youth mental health problems were significantly positive across entity theories of intelligence (95% CI = .13, .28), personality, (95% CI = .17, .42), and peer relationships, (95% CI = .10, .37). Although this association appeared stronger for personality entity theories than for other domains, moderation effects were not significant, $F(2,14) = 1.25, p = .32$. Associations between entity theories and youth problems did not significantly differ for "true" psychopathology (95% CI = .18, .34) versus more general distress (95% CI = .04, .45), $t(15) = -.21, p = .84$. Further, results did not support methodological rigor as a categorical moderator (95% CI = -.01, .01), $t = .04, p = .97$.

3.4. Publication bias

No significant ES difference emerged for published (95% CI = .17, .31) versus unpublished studies (95% CI = -.04, .66), $t(15) = .60, p = .56$. To

test further for possible publication bias, studies were examined using a funnel plot and Egger's regression test (see Fig. 2). The slope of Egger's regression line was statistically significant, $t(17) = 3.39, p < .01$, slope = .21, with less precise studies tending to reduce the absolute value of the overall mean effect size. Although this slope is relatively small, it is statistically significant, raising the possibility of publication bias across studies (with unpublished studies producing slightly smaller ESs).

4. Discussion

This random-effects meta-analysis of an emerging body of research showed a theoretically important positive association between entity theories and youth mental health problems. Entity theories were positively related to both internalizing and externalizing mental health problems, with a marginally stronger association for youth internalizing problems. No other candidate moderators approached significance: the strength of association between theories and mental health problems did not differ across variations in methodological characteristics (rigor, publication status, implicit theory measurement model), implicit theory domain, and youth problem type (psychopathology versus general distress).

Prior research on implicit theories has focused largely on youths' academic and motivational outcomes (Burnette et al., 2013). The present study, to our knowledge, offers the first systematic overview of associations with youth mental health problems. Overall, the mean meta-analytic association was robust across methodological and substantive aspects of original research reports. The consistency of findings across study variations in methodology and substantive focus suggests that implicit theories, across domains, relate to general psychological dysfunction in youths, although some individual studies suggest that certain implicit theory domains might be especially linked to youth problems. For instance, Yeager, Trzesniewski, and Dweck (2013) and Yeager, Miu, et al. (2013) found that, compared to a control intervention teaching incremental theories of athletic abilities, an intervention teaching adolescents to adopt incremental theories of personality produced greater reductions in hostile attributional biases. Accordingly, implicit theories in a number of domains—and perhaps certain domains, in particular—might be promising intervention targets for youths experiencing or at risk of a broad array of mental health problems, including aggression, anxiety, and depression. Training youths to adopt incremental rather than entity theories about their personal traits—their intelligence, personality, and sociability—might boost their confidence that positive change is possible and increase their investment in strategies for coping with everyday stressors, preventing or alleviating distress, and building the skills needed to enhance adaptation. Indeed, studies by Yeager and colleagues (Yeager, Miu, et al., 2013; Yeager, Trzesniewski, et al., 2013) found that brief interventions have helped adolescents develop more incremental implicit theories of personality, as well as improved short-term depressive symptoms and aggressive intent (Yeager, Trzesniewski, et al., 2013). Future research might explore the applicability of such interventions to different kinds of implicit theories, more severe levels of youth psychopathology, and broader efforts to prevent youth dysfunction in the longer term.

The potential value of applying implicit theories to mental health interventions is underscored by evidence on the malleability of implicit theories early in life. Short-term laboratory studies with children as young as 4 years old have shown that praising children for their ability (e.g., “you are so smart”) leads them to adopt attitudes, behaviors, and beliefs consistent with an entity theory, including greater helplessness, whereas praising children for their work, effort, or strategies (e.g., “you worked so hard”) leads them to adopt attitudes, behaviors, and beliefs consistent with an incremental theory (Cimpian, Arce, Markman, & Dweck, 2007; Mueller & Dweck, 1998). Further, Gunderson et al. (2013) found that parents' spontaneous praise of children's effort as 14–38 months predicted incremental frameworks at ages 7 to 8.

These past findings, coupled with the present meta-analysis, suggest both one possible etiology for the risk factors that could give rise to internalizing or externalizing problems in youth, and one possible pathway to intervention.

The fact that both internalizing and externalizing youth problems showed significant associations with entity theories may have significant clinical implications. For instance, interventions such as those studied by Yeager, Trzesniewski, et al. (2013), which focused on promoting incremental theories, helped reduced short-term depression and aggression. To build on these existing studies, future work might assess whether such interventions can reduce youth internalizing and externalizing problems (a) in ways relevant to more severely distressed youths and (b) across longer-term periods.

Findings did not differ by multiple potential moderators. The fact that implicit theory domain (peer relations, intelligence, personality) did not moderate the relation between entity self-theories and mental health problems may appear surprising, given that the logical connection to mental health seems less compelling for entity theories of intelligence than for entity theories of personality and peer relations, both of which are common foci of mental health problems. The consistency across domains suggests that it may be the entity beliefs, rather than their particular substantive content, that conveys risk of mental health problems. However, as discussed, some studies suggest the possibility that certain kinds of implicit theories (e.g., personality theories) may have greater impact on subsequent mental health outcomes than others (e.g., athletic ability theories) (Yeager, Miu, et al., 2013). Separate analyses showed no evidence that methodological factors moderated relations between implicit theories and youth mental health problems. Most studies were rated as having relatively high methodological rigor, and moderation analyses yielded no significant effect of methodological rigor on mean ES. These findings suggest that the results reported here did not reflect artifacts that sometimes hamper interpretation of meta-analyses.

Third, although moderation analyses failed to reveal significant differences in ESs in published versus unpublished studies, the slope of Egger's regression line was statistically significant. Therefore, we cannot discount the possibility of publication bias in this group of studies. It is notable that the significance of this effect appeared to be driven by a shortage of less precise studies (i.e., toward the lower half of the graph), suggesting that publication bias might be relatively low. Further, given the small number of studies meeting inclusion criteria for this meta-analysis, one or two studies alone might well create a significant asymmetry in the funnel plot. As more published and unpublished research emerges on relations between implicit self-theories and youth mental health, continued attention to publication bias in this area will be warranted.

Of course, a meta-analysis is only as complete as the body of literature it synthesizes (Lipsey & Wilson, 2001; Samson, Ojanen, & Hollo, 2012). Thus, it is important to acknowledge limitations in the literature we were able to identify for inclusion. First, the present analyses relied on meta-analytic aggregation of unadjusted (i.e., zero-order) correlations. Zero-order correlations are not ideal for assessing relations between variables, as they do not address possible confounding variables that may influence the relation of interest. Although 9 of the 17 studies in this meta-analysis did include full covariate models, the specific covariates used across studies varied greatly. Thus, to maintain comparability across the studies' reported associations, the present meta-analysis had to be limited to zero-order correlations. However, full-covariate models in individual studies suggest that the relation between implicit theories and mental health does persist, even after accounting for potential confounding variables. Specifically, significant associations persisted between implicit theory and mental health variables after controlling for youth gender (Ahmavaara & Houston, 2007; Da Fonseca et al., 2008; Shih, 2011), youth age (Ahmavaara & Houston, 2007; Brown, 2009; King et al., 2012;), academic achievement (Gerber & O'Connell, 2012; Lindsay, 2006), peer victimization (Rudolph, 2010), adaptive and maladaptive perfectionism (Shih, 2011), bad feelings

about the self and bad-person attributes (Yeager, Trzesniewski, et al., 2013), and mastery versus performance goal orientation (King et al., 2012; Lindsay, 2006).

Second, some potentially important demographic factors could not be examined as moderators. Although the studies all included mixed-gender samples, none provided separate ESs for boys and girls. Most studies lacked detailed information about participants' ethnicities, and reports of SES varied across studies (e.g., parental education; district-wide averages; statements that participants "were of diverse socioeconomic backgrounds"). Thus, we could not assess gender, ethnicity, or SES as moderators. We were also unable to assess youth developmental period as a moderator, because all studies except one (Brown, 2009) focused on early adolescent samples (ages 10–15). As more research on implicit self-theories and youth mental health accumulates, and with more consistent reporting of sample demographics, it will be useful to test whether associations apply differently across youth subpopulations.

Third, most included studies reported cross-sectional rather than longitudinal associations between implicit theories and youth mental health problems. Accordingly, the findings do not establish the causal direction of the meta-analytic associations. One theoretically plausible possibility is that implicit theories and youth mental health relate reciprocally to one another. For instance, a child who views her shyness as fixed might experience a negative social interaction, increasing her social anxiety. Due to this anxiety, she might find social situations increasingly difficult, reinforcing her initial belief that her shyness is fixed. Future studies should incorporate longitudinal designs to parse possible causal pathways, including such reciprocal patterns. In addition to generating causal information, prospectively testing implicit theories as risk factors for youth mental health problems will help evaluate their promise as intervention targets.

Despite these limitations, results revealed robust links between entity theories and youth mental health problems, suggesting the potential role of these theories as risk factors, as well as their potential as targets for youth mental health interventions. To better explore this possibility, future studies might examine more nuanced, prospective pathways underlying the implicit theory–youth mental health link. For instance, it will be useful to explore other moderators and mediators of this association to assess how, and for whom, the association is most likely to develop and most potent in its impact. Further, future research may employ additional kinds of implicit theory assessments. The current implicit theory measures are typically based on self-report assessments. Given biases associated with self-report, the creation of behavioral or subtle associational measures for implicit theories—for instance, using the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998)—might help establish the extent of their influence on youth mental health trajectories and outcomes. By employing novel measurement approaches and targeting diverse populations, efforts to parse relations between implicit theories and youth mental health may inform the development and refinement of interventions to treat and prevent a range of youth problems.

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Contributors

JLS designed the study and designed the protocol. MRA and JLS conducted literature searches, identified relevant studies, and coded included studies for this meta-analysis. JLS conducted statistical analyses. JLS wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest

All authors report that they have no conflicts of interest.

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