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Early implicit–explicit discrepancies in self-esteem as correlates of childhood depressive symptoms

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ABSTRACT

This longitudinal study examined early social–cognitive markers that might be associated with the emergence of childhood depression and anxiety. At 5 years of age, 137 children completed an implicit self-esteem measure. At 9 years of age, the same children completed measures of implicit self-esteem, explicit self-esteem, depression, and anxiety. Two novel findings emerged. First, higher implicit self-esteem at age 5 than explicit self-esteem at age 9 (implicit > explicit discrepancy) was associated with depressive symptoms at age 9, but not with symptoms of anxiety. Second, this cross-age implicit > explicit discrepancy was associated with depressive symptoms more strongly than was the same implicit > explicit discrepancy measured concurrently at age 9. The overall pattern suggests that the appearance of depressive symptoms in children is associated with discrepancies between implicit and explicit self-esteem and not just lower levels of implicit self-esteem or lower levels of explicit self-esteem taken alone. It is the *direction and discrepancy* across time that is particularly informative, such that discrepancies between early implicit representations and later explicit reports of self-worth reflect a developmental pathway associated with elevated risk for depressive symptoms. Taken altogether, this study illustrates the benefits of combining work in developmental, child-clinical, and social psychology to provide a more complete view of the developing child.

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We believe that combining implicit and explicit measures of self-esteem across developmental time points can be used to examine early markers of depression in children at younger ages than typically possible with explicit measures alone.

Introduction

Depression and anxiety are common among children and adolescents. Population-based studies suggest that approximately 10% to 15% of U.S. children experience major depression, and one third develop an anxiety disorder (Kessler et al., 2012). Internalizing psychopathology that begins in childhood is associated with a host of adverse long-term consequences, including elevated risk for substance use, heightened risk for recurrent depression, and anxiety disorders in adulthood (Lewinsohn, Rohde, Seeley, Klein, & Gotlib, 2000; Pine, Cohen, Gurley, Brook, & Ma, 1998). This highlights the importance of creating developmentally appropriate screening tools that can identify the emergence of internalizing problems in childhood (Luby, 2010). This study evaluated whether combining explicit and implicit measures of childhood self-esteem can be a useful approach toward developing markers for the emergence of depressive and anxiety symptoms in middle childhood, which can then be tested in the future for classification accuracy and potentially used in benchmark validation studies.

The link between self-esteem and the onset of psychopathology has been well established, and the two have been closely aligned in the literature for decades (Harter, 1993; Prinstein & La Greca, 2002). A robust debate is emerging in the literature about how implicit and explicit self-esteem may relate to the onset of internalizing problems (Creemers, Scholte, Engels, Prinstein, & Wiers, 2012; van Tuijl, de Jong, Sportel, de Hullu, & Nauta, 2014), but empirical studies of young children using longitudinal designs are lacking.

The current study focused on the two most frequent manifestations of internalizing problems in childhood (i.e., depression and anxiety) to examine whether implicit and explicit self-esteem are transdiagnostic across the emotional disorders (i.e., predictive of *both* anxiety and depression) or are specific to only one type of symptoms (depression or anxiety *only*). As will be shown, the current study provides a novel way of combining implicit and explicit measures of self-esteem to detect the emergence of depressive symptoms, but not anxiety symptoms, in children at younger ages than currently possible. In particular, early self-esteem discrepancies at 5 to 9 years of age are easily measured markers that could be used by providers to signal the importance of doing a more detailed screening for depression and potential referral to early intervention services.

Self-esteem discrepancies and psychopathology

Self-esteem is widely conceived as a relatively stable trait, consisting of positive self-regard or attitude. Low explicit self-esteem has long been associated with the onset and maintenance of internalizing problems (Harter, 1993). It has also been suggested that implicit self-esteem should be considered when trying to understand the development of psychopathology (Bosson, Brown, Zeigler-Hill, & Swann, 2003). Whereas *explicit* self-esteem is usually defined as a "conscious feeling of self-liking, self-worth, and acceptance" (Zeigler-Hill, 2006, p. 120), *implicit* self-esteem is defined as a "cognitively simple association of self with valence (*me* = *good*)" (Cvencek, Greenwald, & Meltzoff, 2016, p. 55). Explicit and implicit self-esteem are also thought to represent outputs of two different systems. Explicit self-esteem is thought to arise through deliberate conscious processing of self-relevant information and is theorized to emerge from a system that is controlled, effortful, and directed by rule-based learning (Haeffel et al., 2007). Implicit self-esteem is considered "the introspectively unidentified ... effect of the self-attitude on evaluation of self-associated and self-dissociated

objects" (Greenwald & Banaji, 1995, p. 11) that arises from intuitive processing affective experiences (for alternative theoretical conceptions and measurement approaches regarding implicit self-esteem, such as using the name letter effect, see Franck, De Raedt, & De Houwer, 2007, and Krizan, 2008).

Because implicit and explicit self-esteem are posited to reflect different underlying processes, discrepancies between the two can develop. Two forms of implicit–explicit self-esteem discrepancies have been identified in the literature. *Fragile self-esteem* consists of higher levels of explicit self-esteem than implicit self-esteem (explicit > implicit self-esteem; Bosson et al., 2003; Jordan, Spencer, Zanna, Hoshino-Browne, & Correll, 2003). *Damaged self-esteem,* on the other hand, reflects higher levels of implicit self-esteem than explicit self-esteem (implicit > explicit self-esteem; Schröder-Abé, Rudolph, & Schütz, 2007). Both types of self-esteem discrepancies imply that individuals hold inconsistent views of the self and lack integration in their self-representations (Bosson et al., 2003; Franck, De Raedt, Dereu, & Van den Abbeele, 2007; Jordan et al., 2003; Schröder-Abé et al., 2007). Implicit–explicit discrepancies are thought to emerge when similar events that affect both implicit and explicit self-esteem (e.g., failure, social rejection) are processed differently (Zeigler-Hill, 2006).

If implicit self-esteem develops primarily through the automatic processing of evaluative feedback at an unconscious level, then—unlike explicit self-esteem—it may be relatively resistant to conscious correction (Hetts & Pelham, 2001). Implicit self-esteem is thought to primarily reflect accumulated social evaluations, whereas explicit self-esteem is considered to be the result of conscious interpretations (and often reinterpretations) of such experiences (Zeigler-Hill, 2006). This difference in how the same experiences are processed cognitively may lead to discrepancies between implicit and explicit self-esteem. In the current study, we examined whether discrepancies between implicit and explicit self-esteem in children are associated with symptoms of childhood depression and anxiety.

Discrepancies between implicit and explicit self-esteem

Prior studies have examined the association between implicit–explicit discrepancies and internalizing problems in adolescent and adult samples using primarily cross-sectional designs. Importantly, the associations of these discrepancies with internalizing psychopathology vary depending on the statistical approach used. Two approaches are common in the literature. Both approaches have produced a substantial body of work regarding the relation of implicit–explicit discrepancies to internalizing problems (see below). The current study for the first time (a) combines the two statistical approaches within the same sample, (b) does so with the youngest child sample to date, and (c) uses a longitudinal design to provide a developmental assessment of the relations between implicit–explicit discrepancies and internalizing problems.

One approach for estimating implicit–explicit discrepancies is to examine their interaction (Aiken & West, 1991). This is often referred to as the Implicit × Explicit Self-Esteem interaction approach. This approach allows for—and directly tests—the possibility that the relations between low explicit self-esteem and internalizing problems may be especially strong in people who are also demonstrating low implicit self-esteem (as evident by a significant interaction between explicit and implicit self-esteem; de Jong, Sportel, de Hullu, & Nauta, 2012). When effects of implicit–explicit discrepancies are tested as an interaction effect of implicit and explicit self-esteem (i.e., collapsing damaged and fragile self-esteem), however, no associations have been found with either depression or social anxiety (Creemers et al., 2012; Creemers, Scholte, Engels, Prinstein, & Wiers, 2013; de Jong et al., 2012; Pavlickova, Turnbull, & Bentall, 2014; Schröder-Abé et al., 2007; van Tuijl et al., 2014). In addition, studies using this statistical approach have generally found that explicit self-esteem measures are negatively correlated with internalizing problems, whereas implicit self-esteem measures are not.

An alternative statistical approach, the Size × Direction approach, was developed by Briñol, Petty, and Wheeler (2006). It tests for implicit–explicit discrepancies as an interaction effect of the Size of Discrepancy × Direction of Discrepancy (i.e., separating damaged self-esteem from fragile self-esteem). According to this approach, it is specifically damaged self-esteem (i.e., implicit > explicit self-esteem) that is associated with psychopathology. Even though the Size × Direction approach seems to categorize all children as having some level of implicit–explicit discrepant self-esteem, research shows that it is only the discrepancies corresponding to damaged self-esteem—and not

fragile self-esteem—that are considered maladaptive and related to the development of depressive symptoms. Indeed, prior work using this approach has observed positive associations between higher levels of damaged self-esteem (i.e., implicit > explicit discrepancies) and depressive symptoms in adolescents and adults (Kesting, Mehl, Rief, Lindenmeyer, & Lincoln, 2011; Lemmens et al., 2014; Pavlickova et al., 2014), depressive symptoms, suicidal ideation, and loneliness in young adult women (Creemers et al., 2012, 2013), bipolar symptoms in adult bipolar patients (Jabben et al., 2014), and negative attributional style, nervousness, and greater health impairment in undergraduate students (Schröder-Abé et al., 2007).

In the one prior study examining implicit–explicit discrepancies and internalizing problems in children (aged 11–12 years), exposure to peer victimization was associated with damaged self-esteem, which, in turn, was associated with increases in internalizing problems across a 1-year follow-up period (Leeuwis, Koot, Creemers, & van Lier, 2015). Together, these findings suggest that implicit–explicit discrepancies may be associated with the development of internalizing problems over and above the effects of explicit self-esteem considered alone. In addition, considering that (a) implicit–explicit discrepancies *are not* associated with depression and anxiety when collapsing damaged and fragile self-esteem (as in the Implicit × Explicit Self-Esteem interaction approach), but (b) implicit–explicit discrepancies *are* associated with depression and anxiety when damaged self-esteem is separated from fragile self-esteem (as in the Size × Direction approach), the overall empirical pattern obtained to date suggests that damaged self-esteem specifically may be a useful vulnerability marker for depressive symptoms.

Implicit–explicit discrepancies across development

Prior studies of self-esteem discrepancies and internalizing problems have largely relied on cross-sectional designs with adult participants (Creemers et al., 2012, 2013; de Jong et al., 2012; Kesting et al., 2011; Lemmens et al., 2014; Pavlickova et al., 2014; Schröder-Abé et al., 2007). To determine whether early implicit–explicit discrepancies in self-esteem are associated with later internalizing problems, longitudinal studies in children are needed. To our knowledge, only two longitudinal studies exist on this topic: one in 11- and 12-year-olds (Leeuwis et al., 2015) and the other in 10- to 16-year-olds (van Tuijl et al., 2014). As noted above, Leeuwis et al. (2015) found that implicit–explicit discrepancies at 11 years of age mediated the relation between age 11 peer victimization and increases in internalizing problems over a 1-year period to age 12. In addition, Leeuwis and colleagues demonstrated that implicit–explicit discrepancies at age 11 were predictive of both (a) age 11 internalizing problems and (b) age 12 internalizing problems, suggesting that implicit–explicit discrepancies may have both concurrent and longitudinal predictive power. In contrast, van Tuijl et al. (2014) found that implicit–explicit discrepancies did not predict major depressive disorder or social anxiety disorder symptomatology at a 2-year follow-up.

The association between implicit–explicit self-esteem discrepancies and internalizing problems has yet to be examined at earlier stages of development. The early emergence of damaged self-esteem may be more strongly associated with the emergence of internalizing problems than damaged self-esteem at later ages, especially if, as some have theorized, high *me = good* self-positivity (implicit self-esteem) tends to develop prior to the formation of explicit self-esteem (Cvencek et al., 2016; DeHart, Pelham, & Tennen, 2006), a point that is further taken up in the Discussion. In addition, a negative explicit representation of the self, once it emerges, is likely to have cascading influences on other domains of development that have been associated with internalizing problems, including dysfunctional attitudes and beliefs (Lee & Hankin, 2009), negative attributional style (Joiner & Wagner, 1995), and peer relationships (Reijntjes, Kamphuis, Prinzie, & Telch, 2010). Early childhood may be a particularly important time to examine self-esteem; as children move from preschool to elementary school, they begin to increasingly rely on social comparisons and their self-evaluations become less positive (Cvencek, Fryberg, Covarrubias, & Meltzoff, 2018; Eccles, Wigfield, Harold, & Blumenfeld, 1993).

Studying the development of implicit–explicit discrepancies in self-esteem in children between preschool and elementary school is also potentially informative for illuminating the developmental course of self-esteem. It has been suggested previously that explicit and implicit self-esteem may have

different developmental trajectories (DeHart et al., 2006; Hetts & Pelham, 2001). In terms of explicit self-esteem, prior research suggests that domain-specific self-evaluations of self-competence are extremely positive for the majority of children tested at or before 8 years of age (Harter, 2006). Due to either cognitive limitations or limitations of available measuring instruments (see below), young children show no evidence of integrating these domain-specific self-evaluations into a higher-order overall explicit evaluation of themselves, which might be called self-esteem (Harter & Pike, 1984). Once formed, these global self-evaluations tend to be positive in middle childhood but drop significantly in adolescence (Thomaes, Brummelman, & Sedikides, 2017). In terms of implicit self-esteem, prior research has established that implicit self-esteem is strong and positive as early as 5 years of age (Cvencek et al., 2016). However, it is not currently known how implicit self-esteem changes between preschool and elementary school because studies have yet to test whether or not implicit self-esteem rises, drops, or stays stable between early and middle childhood.

Research context

Based on prior literature demonstrating (a) that both implicit self-esteem (Cvencek et al., 2016) and domain-specific explicit self-evaluations (Harter, 2006) are already positive for the majority of children tested from 5 to 7 years of age, (b) a strong link between self-esteem and the onset of psychopathology (Prinstein & La Greca, 2002), and (c) increased prevalence of depressive and anxiety symptoms in adolescence (Kessler et al., 2012), the current study longitudinally followed the same children from preschool (Time 1: 5 years of age) to middle childhood (Time 2: 9 years of age) using a community sample of children before internalizing symptoms become clinically meaningful.

Time 1 of this research was a part of a larger project aimed at developing and validating a measure of implicit self-esteem with 5-year-old children. The selection of 5-year-olds was prompted by the fact that most of the work on young children's self-evaluations and self-worth was limited to explicit measures using self-report and picture identification. Two of the most widely used measures in this regard are the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (PSPCSA; Harter & Pike, 1984) and the Self-Description Questionnaire for Preschoolers (SDQP; Marsh, Ellis, & Craven, 2002). Despite being the best extant instruments for children's self-evaluations at the time when we initiated our research with 5-year-olds, both the PSPCSA and SDQP have acknowledged limitations regarding their use with very young children (who might not be highly self-reflective or facile at introspective self-reports). The developers of these scales cautioned that they are not to be considered as good measures of self-esteem per se at young ages. Specifically in the article reporting the PSPCSA, Harter and Pike (1984) stated, "Given the structure of this scale, we strongly urge that the scale not be viewed as an index of self-concept or self-esteem per se" (p. 1971). Likewise, Marsh et al. (2002) article on the SDQP reported that "extensive pilot testing suggested that preschool children could not clearly understand the [global self-esteem scale] items. Hence, this scale was excluded from the SDQP" (p. 381).

Due to unavailability of explicit self-esteem measures for children as young as 5 years when this study was started, the chief method of validation was to determine whether the theoretically expected "balanced identity" relationships among implicit measures of gender identity, gender attitudes, and self-esteem—which have been confirmed with adults—could also be obtained in samples of preschool children using our new implicit measure. Once the measure was developed and validated (as reported in Cvencek et al., 2016), we decided to reassess implicit self-esteem at an older age when a *validated explicit measure* could also be reliably administered (9 years).[1] Because of the robust findings linking explicit self-esteem measures and measures of depressive and anxiety symptoms in the literature—as well as the emerging literature on implicit–explicit discrepancies—we designed the follow-up study at Time 2 (9 years of age) to include measures of depressive and anxiety symptoms. This allowed us to evaluate for the first time whether the assessment of implicit–explicit discrepancies in self-esteem might provide useful information.

[1] According to Harter and Pike (1984), "Both theory (see Harter, 1983) and empirical findings have led to the conclusion that children are not capable of making judgments about their worth as persons until approximately the age of 8" (p. 1970). That was the reason for picking age 9 as the relevant age to study explicit self-esteem at Time 2.

Consequently, at the time we initiated this study, we could not plan to administer both implicit and explicit measures of self-esteem at both ages because there was no validated measure of explicit self-esteem reported in the literature that could be used as early as 5 years of age. However, our design incorporated the measurement of both implicit and explicit self-esteem at the 9-year-old assessment (Time 2). Without assessing explicit self-esteem and/or internalizing problems at baseline, our ability to understand changes in symptoms over time is limited (see "Limitations and future directions" section in Discussion). Yet, the inclusion of implicit data at age 5 provided three empirical benefits. First, it allowed for an examination of the predictive power of longitudinal implicit–explicit discrepancies in self-esteem. The predictive power of such discrepancies has already been shown in prior longitudinal research with *adolescents* over a *1-year* period (Leeuwis et al., 2015); however, it was unknown how stable these patterns are over a longer period of time (we used the period from 5 to 9 years of age). Second, it was also unknown whether implicit–explicit discrepancies in self-esteem increased, decreased, or remained stable as children transition from early to middle childhood. Third, it also permitted us to provide the first longitudinal investigation of how implicit self-esteem itself might change between the preschool period and the threshold of adolescence.

Aims and hypotheses

This study investigated the role of explicit and implicit self-esteem and their relations to the presence of depressive and anxiety symptoms in 137 children followed longitudinally at two time points (5 and 9 years of age). Three hypotheses were examined. First, based on literature with adolescents and adults, we expected that higher implicit self-esteem than explicit self-esteem (damaged self-esteem) would be associated with higher levels of internalizing problems from preschool to early elementary school (and higher levels of fragile self-esteem would not). Second, based on literature with adults, we expected that implicit–explicit discrepancies in self-esteem would be more strongly associated with the presence of depressive symptoms than the presence of anxiety symptoms. Third, based on literature with adolescents, we predicted that the implicit–explicit discrepancies in self-esteem would be associated with depressive symptoms both longitudinally and concurrently. In examining these three hypotheses, the study also aimed to increase our understanding of whether implicit self-esteem changes or remains stable over the period from 5 to 9 years of age.

Method

Participants

All child participants were recruited through a university-operated participant registry by contacting parents via phone and e-mail, and all children were tested in a laboratory setting. A total of 195 preschoolers participated at 5 years of age when they were in kindergarten (Time 1) as a part of a study of social–emotional development (Cvencek et al., 2016). Of those children, 70% were able to be recruited again to participate at 9 years of age when children were in Grade 3 (Time 2). Analyses show that this sample (the 70% who participated again at age 9) did not differ from the other children (the 30% who declined participation at age 9) on any of the age 5 measures (see Section 1.1 of the online supplementary material). This resulted in a sample of 137 participants (M_{age} = 9.03 years, *SD* = 0.06; 67 girls) at age 9. According to parental report, the racial/ethnic makeup of the sample was 85.4% White, 1.5% Asian, 0.7% African American, 11.7% multiracial, and 0.7% other/unknown, with 5.8% reporting Hispanic ethnicity. Parents reported an average of 16.62 years of education (*SD* = 1.96) and a combined median household income of $120,000 (at the Time 2 measurement). All children were described by their parents as typically developing. Each family received up to $50 for participation.

Materials and procedure

At both ages, children were tested individually in a quiet room (3.0 × 2.4 m) while seated at a desktop computer (53.3-cm screen). The experimenter gave instructions orally. Test sessions began with a

3 to 5-min description of the study, during which children learned that they would "play a game" and were introduced to the test apparatus. Children completed the implicit measure at age 5 and completed both the implicit and explicit measures at age 9. (It should be noted that because the explicit self-esteem construct often matches closely with items on the widely used self-report measures of depression and anxiety, the use of implicit self-esteem measures in the current study helps to overcome the multicollinearity problems potentially arising from multiple measures being based on explicit self-reports only.)

Age 5 (Time 1) measures

The implicit self-esteem measure used at 5 years of age was a Preschool Implicit Association Test (PSIAT), which is a procedure that has been extensively validated as a measure of implicit self-esteem for use with children of this age (Cvencek et al., 2016). Given the absence of valid self-report measures of self-esteem for preschool children when this research was started, no explicit measures were administered at age 5. PSIAT measures of gender attitude and gender identity were also administered at age 5; however, those measures are unrelated to this report.

Implicit self-esteem at age 5.

The pictorial–audio PSIAT described by Cvencek et al. (2016) does not depend on participants being able to read and thus was used here because it is most suitable for preschoolers. In the PSIAT's sorting task, stimuli in four categories are presented on a computer screen. Children rapidly sort the stimuli using two response keys. The PSIAT is based on the principle that it is easier to give the same response to items from categories that are mentally associated than to ones that are not. For example, the pairing of *light* with *day* and of *dark* with *night* would be "congruent," whereas the pairing of *light* with *night* and of *dark* with *day* would be "incongruent," and participants would be expected to respond more quickly and with greater facility to the congruent pairings. The faster the participants' responses, the stronger the presumed underlying association between the 2 items.

A PSIAT that uses the four categories—*me, not-me, positive,* and *negative*—comprises a self-esteem task. This task can be used to test the association of self with either positive or negative valence attributes. For a child with high self-esteem, a PSIAT task that requires sorting *me* with positively valenced words (and *not-me* with negatively valenced words) should be performed rapidly and easily, indicating at an implicit level a positive attitude toward self (*me = good*).

The *me* and *not-me* categories were represented by two sets of novel flags as described by Cvencek et al. (2016); one set had been given to the child ("my flags"), and another set did not belong to the child ("not my flags"). Children, similar to adults (Beggan, 1992), evaluate items that they come to own as the result of a gift more favorably than comparable unowned items. The *good* and *bad* concepts were represented with four *good* words (*good, happy, fun,* and *nice*) and four *bad* words (*bad, yucky, mean,* and *mad*), respectively. These words were simultaneously presented as audio recordings as well as written stimuli, thereby eliminating the need for reading. In one task, *my* flags and *good* words shared a response key, as did *not-my* flags and *bad* words. In the other task, the assignment of the *good* and *bad* words was reversed.

The PSIAT self-esteem scores were computed using the *D* measure—an effect-size-like measure using the scoring algorithm developed by Greenwald, Nosek, and Banaji (2003). The *D* measure has computational upper and lower bounds of +2 (*me = good*) and −2 (*me = bad*), with the value of 0 indicating equally strong association of self with both positive and negative valence. Positive scores indicated positive implicit self-esteem. Cronbach's alpha—calculated from two *D* measures computed for matched 40-trial subsets of the self-esteem PSIAT—at age 5 was $\alpha = .77$.

Age 9 (Time 2) measures

The implicit self-esteem measure used at 9 years of age was based on a text and audio Child Implicit Association Test (Child IAT) version developed and validated for use with elementary school children, who are able to read (Cvencek, Meltzoff, & Greenwald, 2011). This version of the implicit self-esteem measure is developmentally appropriate for the age group tested here. The 9-year-olds

also completed explicit child-friendly measures of global self-esteem, depressive symptoms, and anxiety symptoms (see below for details).

Implicit self-esteem at age 9.

The Child IAT used the same four categories as the age 5 implicit self-esteem measure: *me, not-me, good,* and *bad.* The Child IAT used both text and audio stimuli (e.g., written words and labels such as *me, other, happy,* and *mad*). The Child IAT measure at age 9 demonstrated a Cronbach's alpha of $\alpha = .73$ (which is a comparable internal consistency to the implicit self-esteem measure at age 5). The Child IAT measure was scored using the same *D* measure scoring algorithm used to compute the age 5 implicit self-esteem measure, so that positive values indicated positive implicit self-esteem.

Explicit self-esteem.

Age 9 explicit self-esteem was measured using the Global scale of the Self-Perception Profile for Children (SPPC; Harter, 1982). The SPPC has 6 items that use a double binary response format. Children are initially asked to choose which of two statements is more descriptive of themselves, and then their response is always followed by a second probe (i.e., is the selected statement "sort of true for me" or "really true for me"?). Sample items include "Some kids don't like the way they are leading their life BUT other kids do like the way they are leading their life" and "Some kids are happy with themselves as a person BUT other kids are often not happy with themselves." The SPPC was shown to be an internally consistent and valid measure of children's self-reported global self-esteem by Harter (1982). Cronbach's alpha was $\alpha = .71$. The SPPC was scored so that positive values indicated positive explicit self-esteem.

Depressive symptoms.

The Children's Depression Inventory (CDI; Kovacs, 1992) contains 26 items that comprise five subscales: Negative Mood, Ineffectiveness, Interpersonal Problems, Anhedonia, and Negative Esteem (1 item assessing suicidal ideation was omitted from administration due to institutional review board restrictions). Each item consists of three statements that describe different levels of severity of a specific symptom of depression (e.g., "I am sad once in a while," "I am sad many times," and "I am sad all the time"). The CDI has respectable psychometric properties such as internal consistency, test–retest reliability, and discriminant validity (Kovacs, 1992). Items were summed to create a total CDI score, with higher scores indicating higher prevalence of depressive symptoms. The CDI total cutoff score of 19 (corresponding to the 90th percentile) has been considered suitable as a general screen for depression in nonclinical populations (Kovacs, 1992). The CDI demonstrated good internal consistency in this sample ($\alpha = .79$).

Anxiety symptoms.

The Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) consists of 39 items and has four subscales: Physical Symptoms, Social Anxiety, Separation Anxiety/Panic, and Harm Avoidance. Responses are on a 4-point scale (i.e., *never true, rarely true, sometimes true,* or *very true*), representing different levels of severity of a specific symptom of anxiety such as "I feel restless and on edge" and "I try to stay near my mom or dad." The MASC has sound psychometric properties (March et al., 1997; Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). Responses were summed to create a total score, with higher scores indicating higher prevalence of anxiety symptoms. The MASC total cutoff score of 54 has been used as a cutoff in screening for anxiety in nonclinical populations (Wood et al., 2002). The MASC demonstrated good internal consistency in this sample ($\alpha = .86$).

Data analysis

Child IAT data were excluded for (a) children who met any one of three previously published exclusion criteria from the Child IAT literature (i.e., excessively slow responding, excessively fast responding, and/or excessively high error rates; Cvencek et al., 2011) ($n = 3$), (b) children whose parents did

not consent to the measures (n = 9), and (c) technical/computer problems during the administration (n = 4). The final sample for which there were valid data at both age 5 and age 9 included 121 children (61 girls).

We first examined the implicit–explicit relationships, and their associations with depression and anxiety, using the standard Implicit × Explicit interaction approach (Aiken & West, 1991; Creemers et al., 2012). Implicit and explicit self-esteem were entered in Step 1, and their interaction was entered in Step 2. CDI and MASC total scores were entered as dependent measures.

Next, a series of hierarchical multiple regression analyses following Briñol et al.'s (2006) Size × Direction approach was used to examine whether implicit–explicit discrepancies were related to depressive symptoms and anxiety. The absolute difference between the standardized score on implicit and explicit self-esteem measures was computed and indicated the *size* of the discrepancy. Rather than using z scores of implicit and explicit measures, standardized scores were computed by dividing the individual implicit and explicit self-esteem scores by their respective standard deviations. This approach maintains the rational zero point of implicit and explicit self-esteem measures, which has been argued to be required when examining measures of association strength. This provided a continuous individual difference score. A higher score on this variable was indicative of a larger implicit–explicit discrepancy. Next, a dummy-coded variable was computed to determine the direction of implicit–explicit discrepancies (explicit > implicit = 0, implicit > explicit = 1). This dichotomous score was used to distinguish children with fragile self-esteem from those with damaged self-esteem, respectively. Using discrepancy scores, a dummy variable, and the interaction between these two has been found to be a suitable way of testing implicit–explicit discrepancies (Briñol et al., 2006; see also Creemers et al., 2013; Leeuwis et al., 2015; Schröder-Abé et al., 2007).

The *size* of the discrepancy and the *direction* of the discrepancy were entered in Step 1, and their interaction was entered in Step 2. Hierarchical multiple regression analyses examining whether implicit–explicit discrepancies were related to depressive symptoms and anxiety were performed for two time points. The discrepancies between age 5 implicit self-esteem and age 9 explicit self-esteem provided an index of *longitudinal* associations. The discrepancies between implicit and explicit self-esteem measures at age 9 provided an index of *concurrent* associations.

Results

Two preliminary analyses examined the effects of demographic background variables for all the implicit and explicit measures. A post hoc power analysis estimated a small effect size of .2 standard deviations and correlation among repeated measures ρ = .10. These estimates generated the minimum sample size of N = 110 needed to detect an interaction effect with 80% power and an alpha level of .05. One univariate analysis of variance (ANOVA) was conducted using the age 5 implicit self-esteem measure as a dependent variable and the three demographic background variables (gender, age, and race) as independent variables. No main effects or interactions were significant (ps > .27). A multivariate analysis of variance (MANOVA) was conducted using the four outcome measures at age 9 (implicit self-esteem, explicit self-esteem, CDI, and MASC) as dependent variables and the three demographic background variables as independent variables. With the exception of a main effect of gender on the explicit self-esteem measure (see Table 1), no other main effects or interactions were observed (ps > .08).

Descriptive statistics

Table 1 displays the means of the implicit and explicit self-esteem measures. Children in this sample displayed positive implicit self-esteem at both age 5 and age 9 as well as positive explicit self-esteem at age 9 (all ts > 11.13, ps < .001, ds > 1.01). See Table 1 for detailed D and SPPC scores for implicit and explicit self-esteem measures. The means and standard deviations of the PSIAT (M = .41, SD = .40) and Child IAT (M = .44, SD = .37) were very similar (Table 1) and produced comparable effect sizes (Cohen's ds of 1.01 and 1.20, respectively), supporting the idea that they were equivalent age-appropriate instruments. On the CDI scale, 3 of 121 participants (2.5%) scored above the

Table 1
Means (and standard deviations) for all the self-esteem and clinical measures.

	Scores		
Measure	Overall (N = 121)	Girls (n = 61)	Boys (n = 60)
Age 5 (Time 1)			
Implicit self-esteem (PSIAT)			
M	**0.41**	**0.41**	**0.40**
(*SD*)	(0.40)	(0.40)	(0.40)
Age 9 (Time 2)			
Implicit self-esteem (Child IAT)			
M	**0.44**	**0.45**	**0.43**
(*SD*)	(0.37)	(0.33)	(0.40)
Explicit self-esteem (SPPC)			
M	**1.23**	**1.38**$_a$	**1.08**$_a$
(*SD*)	(0.62)	(0.61)	(0.60)
Depression (CDI)			
M	**6.92**	**6.25**	**7.60**
(*SD*)	(5.01)	(5.16)	(4.79)
Anxiety (MASC)			
M	**47.18**	**46.13**	**48.25**
(*SD*)	(13.62)	(14.44)	(12.77)
Discrepancies			
ISE_5–ESE_9 (longitudinal)			
M	**1.42**	**1.51**	**1.33**
(*SD*)	(1.05)	(1.00)	(1.11)
ISE_9–ESE_9 (concurrent)			
M	**1.34**	**1.45**	**1.22**
(*SD*)	(0.94)	(0.93)	(0.96)

Note. PSIAT, Preschool Implicit Association Test; IAT, Implicit Association Test; SPPC, Self-Perception Profile for Children; CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children. ISE_5, age 5 implicit self-esteem *D* score; ESE_9, age 9 explicit self-esteem; ISE_9, age 9 implicit self-esteem *D* score. Boldface indicates (a) significant difference from the rational zero point in the case of ISE and ESE *D* measures and (b) significant difference from clinical cutoffs for depression (i.e., score of 19 on CDI) and anxiety (i.e., score of 54 on MASC) ($ps < .05$). Means in the same row sharing subscripts are significantly different from each other ($p < .05$).

clinical cutoff of 19.[2] All the analyses reported below were repeated, excluding the 3 children who scored above the CDI cutoff of 19. The resulting analyses are reported in the Section 2 of the supplementary material (Tables S2 and S3). All results are similar to those reported below.

On the MASC scale, 35 of 121 participants (28.9%) scored above the clinical cutoff of 54. A Kolmogorov–Smirnov test indicated that MASC scores at age 9 followed a normal distribution, $D(121) = 0.068$, $p = .20$, whereas CDI scores at age 9 did not, $D(121) = 0.13$, $p < .001$. Detailed analyses addressing the issue of normal distribution of the CDI and MASC measures, as well as the justification for the use of untransformed scores for both outcome measures, are provided in Section 3 of the supplementary material (Fig. S1 and Tables S4–S6).

Intercorrelations among the measures

The correlations between all implicit and explicit measures were examined. Testing for implicit–explicit correspondence both within and across the two time points assessed (5 and 9 years of age) allowed evaluating both concurrent and longitudinal relations. In the case of implicit self-esteem

[2] The three scores above the clinical cutoff of 19 (i.e., 20, 21, and 23) all were below the score of 25, which is traditionally taken as being indicative of major depression (Bang, Park, & Kim, 2015). Neither the parents nor the children were recontacted based on these scores due to the general understanding in the field that a one-time administration of the CDI is not sufficient for making clinical diagnoses (Fristad, Emery, & Beck, 1997) and the widely shared view that the CDI is better administered in multiple assessments and in combination with other diagnostic tools (e.g., structured clinical interviews) for an adequate mental health assessment (Cohen, Thakur, Burkhouse, & Gibb, 2019).

measures, this also allowed us to evaluate the developmental stability of implicit self-esteem over a 4-year period from preschool to late elementary school.

Age 5 implicit self-esteem correlated with age 9 implicit self-esteem (r = .29, p = .001). A Spearman rank-order correlation between age 5 and age 9 implicit self-esteem scores yielded similar results, $r_s(119)$ = .34, p < .001. Age 9 explicit self-esteem correlated negatively with depressive symptoms (r = −.54, p < .001) and anxiety symptoms (r = −.27, p = .003). Depressive and anxiety symptoms were also correlated (r = .49, p < .001) (see Section 1.2 of supplementary material [Table S1] for details).

Implicit × Explicit interaction approach

In a model examining the main effects of age 5 implicit self-esteem and age 9 explicit self-esteem (Table 2), age 9 explicit self-esteem was significantly and uniquely associated with depressive symptoms (β = −.54, p < .001) and anxiety symptoms (β = −.28, p = .002). (Because no gender difference was found on any discrepancy measures, the regression models testing the effects of discrepancies here and below are reported collapsing across gender.) No significant associations of age 5 implicit self-esteem were found with age 9 depressive symptoms (β = .07, p = .40) or anxiety symptoms (β = −.12, p = .18). In Step 2, the interaction between age 5 implicit self-esteem and age 9 explicit self-esteem was entered but was not statistically significant for either depressive or anxiety symptoms ($|\beta|$s ≤ .10, ps > .65).

The same analyses were repeated examining the associations of age 9 implicit self-esteem and age 9 explicit self-esteem with CDI and MASC scores. These analyses yielded highly similar results; age 9 explicit self-esteem was significantly associated with both depressive symptoms and anxiety symptoms ($|\beta|$s ≥ .27, ps < .003). Neither the effect of age 9 implicit self-esteem nor the interaction between age 9 implicit self-esteem and age 9 explicit self-esteem was significant (see Table 2 for details).

Size × Direction approach

As shown in Table 3, there was no significant association between the size of the discrepancy and depressive symptoms (β = −.10, p = .30) or anxiety symptoms (β = .02, p = .85). However, the direction of the discrepancy was significantly associated with depressive symptoms (β = .28, p = .003) but not with anxiety symptoms (β = .16, p = .11). Moreover, the Size × Direction interaction was associated with depressive symptoms (β = .56, p < .001) but not with anxiety symptoms (β = .05, p = .73). For children with damaged self-esteem (implicit > explicit), the association between the size of the discrepancy and the presence of depressive symptoms was positive and statistically significant (r = .58, p = .001); for children with fragile self-esteem (explicit > implicit), the association between the size of the discrepancy and the presence of depressive symptoms was negative (r = −.28, p = .007) (see Fig. 1A). Neither damaged nor fragile self-esteem was related to anxiety symptoms (all ps > .63). In sum, these findings indicate that discrepancies between age 5 implicit self-esteem and age 9 explicit self-esteem are significantly related to higher levels of depressive symptoms at age 9 but not to higher levels of anxiety symptoms at age 9.

The same analyses were repeated using age 9 implicit and explicit self-esteem (see Fig. 1B). The results of the analyses of discrepancies between age 9 implicit self-esteem and age 9 explicit self-esteem were directionally similar but somewhat weaker than the result in the analyses of the discrepancy between age 5 implicit self-esteem and age 9 explicit self-esteem. There was no significant association between the size of the discrepancy with depressive symptoms (β = −.09, p = .32) or anxiety symptoms (β = −.01, p = .88). The direction of the discrepancy was significantly associated with depressive symptoms (β = .24, p = .011) but not with anxiety symptoms (β = .14, p = .14). Moreover, the Size × Direction interaction was associated with depressive symptoms (β = .34, p = .019) but not with anxiety symptoms (β = .10, p = .53).

Importantly, we compared the prediction of depressive symptoms using both the *longitudinal* Size × Direction interaction (i.e., between age 5 implicit self-esteem and age 9 explicit self-esteem) and the *concurrent* Size × Direction interaction (i.e., between age 9 implicit self-esteem and age 9 explicit self-esteem). This was done using Cohen and Cohen's (1983, p. 57) test of significance of difference between dependent correlations. This test revealed that the longitudinal Size × Direction

Table 2
Hierarchical regression analysis examining relationships of CDI and MASC scores with implicit and explicit self-esteem.

		Step 1							Step 2		
		ISE			ESE				ISE × ESE interaction		
Comparison/Criterion	ΔR^2	*B*	*SE*	*β*	*B*	*SE*	*β*	ΔR^2	*B*	*SE*	*β*
ISE_5–ESE_9 (longitudinal)											
Depression (CDI)	.30	0.82	0.97	.07	−4.33	0.63	−.54***	.00	−0.11	1.62	−.01
Anxiety (MASC)	.09	−4.09	3.01	−.12	−6.12	1.95	−.28**	.00	2.28	5.04	.10
ISE_9–ESE_9 (concurrent)											
Depression (CDI)	.30	−1.03	1.05	−.08	−4.41	0.62	−.55***	.01	2.26	1.81	.24
Anxiety (MASC)	.08	−2.53	3.29	−.07	−5.92	1.95	−.27**	.02	−9.24	5.62	−.36

Note. $N = 121$. ISE_5, age 5 implicit self-esteem; ESE_9, age 9 explicit self-esteem; ISE_9, age 9 implicit self-esteem; CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children.
** $p < .01$.
*** $p < .001$.

Table 3
Hierarchical regression analysis examining relationships of CDI and MASC scores with the discrepancy between implicit and explicit self-esteem.

		Step 1							Step 2		
		Size of discrepancy			Direction of discrepancy				Size × Direction interaction		
Comparison/Criterion	ΔR^2	*B*	*SE*	*β*	*B*	*SE*	*β*	ΔR^2	*B*	*SE*	*β*
ISE_5–ESE_9 (longitudinal)											
Depression (CDI)	.10	−0.46	0.44	−.10	3.16	1.04	.28**	.14	5.27	1.15	.56***
Anxiety (MASC)	.02	0.23	1.24	.02	4.77	2.96	.16	.00	1.25	3.56	.05
ISE_9–ESE_9 (concurrent)											
Depression (CDI)	.08	−0.49	0.49	−.09	2.59	1.00	.24*	.04	3.06	1.29	.34*
Anxiety (MASC)	.02	−0.21	1.38	−.01	4.13	2.81	.14	.00	2.33	3.70	.10

Note. $N = 121$. ISE_5, age 5 implicit self-esteem; ESE_9, age 9 explicit self-esteem; ISE_9, age 9 implicit self-esteem; CDI, Children's Depression Inventory; MASC, Multidimensional Anxiety Scale for Children.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

interaction between age 5 implicit self-esteem and age 9 explicit self-esteem was significantly stronger than the concurrent Size × Direction interaction between age 9 implicit self-esteem and age 9 explicit self-esteem, $t(120) = 2.53$, $p = .013$, $d = 0.46$. Using the same approach to compare the prediction of depressive symptoms with the prediction of anxiety symptoms revealed that the prediction of depressive symptoms from the Size × Direction interaction was significantly stronger than the prediction of anxiety symptoms, for both concurrent and longitudinal comparisons (see Table 3), *t*s (120) > 2.11, *p*s < .037, *d*s > 0.38.

In addition, to evaluate the usefulness of implicit self-esteem measures at age 5 versus age 9, all the regressions were also run using the average of the age 5 and age 9 implicit self-esteem measures (see Sections 4.1 and 4.2 of supplementary material [Tables S7 and S8]). These analyses produced mostly the same result as the age 5 analyses, suggesting that age 5 and age 9 implicit self-esteem measures are close to equally useful.

Finally, additional analyses were conducted to examine how much explanatory power the implicit–explicit discrepancy may add to the main effect of explicit self-esteem (see Section 5 of supplementary material [Table S9]). In each of the four regressions, the CDI or MASC score was entered as a dependent variable. Explicit self-esteem was entered in Step 1, and the size of the discrepancy and direction of the discrepancy (dummy) were entered at Step 2. The Size × Direction interaction was added in Step 3. In the analysis predicting depressive scores using longitudinal associations, a statistically significant

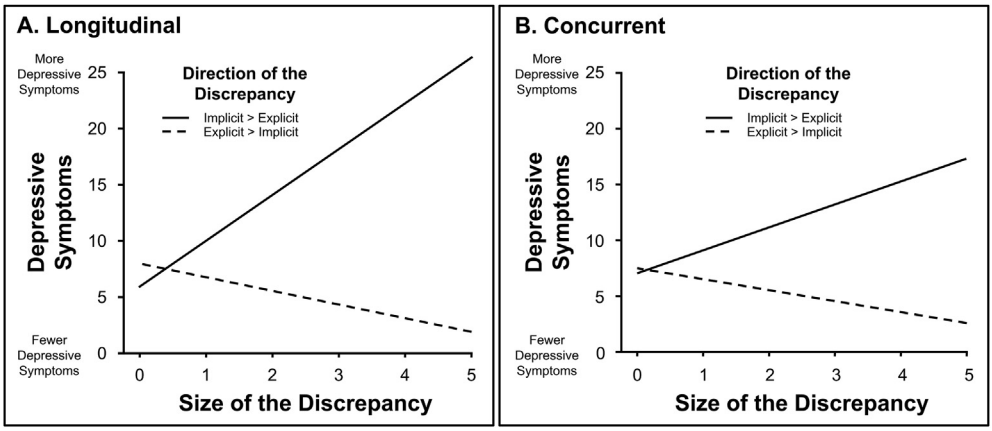

Fig. 1. Relation between depressive symptoms at age 9 and (longitudinal) discrepancies between age 5 implicit self-esteem and age 9 explicit self-esteem (A) and relation between depressive symptoms at age 9 and (concurrent) discrepancies between age 9 implicit self-esteem and age 9 explicit self-esteem (B) for children categorized as having damaged self-esteem (implicit > explicit) or fragile self-esteem (explicit > implicit) at age 9. N = 121.

Size × Direction interaction at Step 3 indicated that this interaction effect added significant explanatory power to CDI scores over and above the explicit self-esteem measure (β = .29, p = .04) (see Table S9 in supplementary material). There was no significant Size × Direction interaction when predicting MASC scores with longitudinal associations (p = .22) or when predicting CDI or MASC scores with concurrent associations (ps > .61).

Discussion

This study examined the links between implicit–explicit discrepancies and the presence of depressive and anxiety symptoms in children in a longitudinal study testing the same children at two time points at 5 and 9 years of age. Three significant results emerged. First, explicit self-esteem, but not implicit self-esteem, was related to depressive and anxiety symptoms in 9-year-olds. Second, higher implicit self-esteem than explicit self-esteem was related to depressive symptoms but not to anxiety symptoms. Third, longitudinal implicit–explicit discrepancies from age 5 to age 9 were predictive of depressive symptoms more strongly than the concurrent implicit–explicit discrepancies at age 9.

Childhood implicit–explicit discrepancies are related to depression but not to anxiety

It is interesting that cross-age implicit–explicit discrepancies from 5 to 9 years of age were more strongly related to depressive symptoms than to anxiety symptoms. Low self-esteem is generally characterized by negative or ambivalent feelings toward oneself. Prior work with elementary school children has established that (a) explicit self-esteem is extremely positive for the majority of children tested at 8 years of age (Harter, 2006) and (b) children as young as 5 years have strong, positive implicit self-esteem comparable to that previously observed in older samples (Cvencek et al., 2016). This is in line with adult social psychology research showing that most adults have a positive attitude toward the self—an effect known as *self-positivity* (Banaji & Prentice, 1994). Asymmetric changes of self-evaluations (e.g., increases in implicit self-esteem and decreases in explicit self-esteem) may lead to discrepancies between implicit and explicit self-esteem if, as theorized, different processes influence implicit and explicit self-esteem (Gawronski & Bodenhausen, 2006). Although depression and anxiety both are characterized by elevated negative affect, low positive affect has been shown to be specific to depression in both children and adults (Chorpita, 2002). Both depression and low self-esteem have a

common denominator of low positive affect (or negative self-evaluation) that is not a core feature of anxiety. Consequently, implicit–explicit discrepancies should be more strongly related to depressive symptoms than to anxiety symptoms, consistent with our results.

A key question is whether low levels of self-esteem are a risk factor for depression in children (i.e., "vulnerability model"; Orth & Robins, 2013) or whether depression causes low levels of self-esteem (i.e., "scar hypothesis"; Lewinsohn, Steinmetz, Larson, & Franklin, 1981). Here, the longitudinal effects show that children whose implicit self-esteem at age 5 is higher than their explicit self-esteem at age 9 are more likely to exhibit symptoms of depression (relative to children whose explicit self-esteem at age 9 is higher than their implicit self-esteem was at age 5). In addition, the lack of associations of implicit self-esteem with depressive or anxiety symptoms suggests that implicit self-esteem at age 5 is likely not a proxy for unmeasurable internalizing problems at age 5. Both results are more consistent with a vulnerability model, although longitudinal data on depression would also be needed to conclude this with confidence.

Longitudinal implicit–explicit discrepancies exceed concurrent implicit–explicit discrepancies as a correlate of age 9 depression

Longitudinal implicit–explicit discrepancies from age 5 to age 9 were more strongly related to depressive symptoms than concurrent discrepancies at age 9. One possibility is that the discrepancy between deep-seated self-relevant goals (as measured by implicit self-esteem) and perceived reality (as measured by explicit self-esteem) may form a basis for negative outcomes (Creemers et al., 2012). Such goal discrepancies are well-established risk factors for the emergence of negative affect, rumination, and depressive symptoms (Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2013). As children develop between 5 and 9 years of age, and perhaps after numerous attempts to bring their self-relevant goals more in line with their perceived reality, they might resort to adjusting their goals instead (i.e., "accommodative coping"; Franck, De Raedt, Dereu, et al., 2007). The accumulation of goal discrepancies over time, and perhaps adjustment to goals as a result, could contribute to our findings that longitudinal discrepancies were larger than concurrent discrepancies. Future research is needed to examine these possibilities empirically.

It is noteworthy that only the implicit–explicit discrepancies that have been considered as "damaged self-esteem" in the literature (high implicit self-esteem combined with low explicit self-esteem) were consistently associated with increased levels of depressive symptoms. This is in line with previous research with adults and adolescents indicating that it is specifically damaged self-esteem that is associated with former depression, current depression, and depression with suicidal ideation (Franck, De Raedt, & De Houwer, 2007; Franck, De Raedt, Dereu, et al., 2007). Even though participants with fragile self-esteem also have discrepant implicit and explicit self-esteem, the discrepancies corresponding to fragile self-esteem do not appear to be related to the development of depressive symptoms. What these results suggest is that it is not just the discrepant implicit and explicit self-esteem that are associated with the development of depressive symptoms; rather, the *direction of this discrepancy* is important in determining whether the discrepancy is associated with depression symptoms. In other words, it appears that it is not how high or low implicit and explicit self-esteem are in an absolute sense, but rather the direction of the discrepancy in a relative sense (to each other), that may reflect a vulnerability marker for depressive symptoms. Future validation studies will profit from combining implicit and explicit measures of self-esteem during development both in a methodological sense (psychometric properties) and in their specific applications to internalizing psychopathology.

It has been proposed that lower explicit self-esteem than implicit self-esteem is a characteristic of people who experience depression before adulthood (van Randenborgh, Pawelzik, Quirin, & Kuhl, 2016). Implicit self-esteem, which is thought to develop at least in part based on social interactions with primary caregivers in early life (Cvencek et al., 2016; DeHart et al., 2006), may be indicative of an "ideal self" (Creemers et al., 2013). With further development, the emergence of explicit self-esteem may be indicative of a more recently formed and consciously held "actual self." Children with higher implicit self-esteem in early childhood than explicit self-esteem later in childhood thus may experience a discrepancy between their early ideal self and their later actual self. This discrepancy between one's desired state and reality may increase risk for depressive symptoms. In adults,

discrepancies between goals and one's current state contribute to rumination about how to reduce such discrepancies (Watkins, 2008); rumination, in turn, is a known risk factor for depression in both children and adults (Hilt, McLaughlin, & Nolen-Hoeksema, 2010; McLaughlin & Nolen-Hoeksema, 2011). Zeigler-Hill and Terry (2007) suggested that people with damaged self-esteem set high standards for themselves and are critical about their own performance. Either of these processes could contribute to depressive symptoms in children with high implicit–explicit discrepancies over time. Finally, it has been argued that implicit–explicit discrepancies are either a sign or a cause of unstable ego functioning in narcissists (Gregg & Sedikides, 2010), and narcissism in turn puts people at increased risk for mental health problems, including drug addiction, depression, and anxiety (Stinson et al., 2008).

Stability of implicit self-esteem across early childhood

The availability of an implicit self-esteem measure that can be used as early as 5 years of age (Cvencek et al., 2016) allowed us to assess the stability of implicit self-esteem during a time period that includes the onset of formal schooling, that is, 5 to 9 years of age. Previous research has shown that explicit self-esteem is positive and stable until early adolescence. In fact, several developmental theorists consider the formation of high and positive self-esteem a major developmental milestone in childhood (e.g., Erikson, 1968; Harter, 2006). Typically, at 5 and 6 years of age, children's explicit self-evaluations are characterized by unrealistic self-positivity and aspirations (Harter, 2006). In middle childhood, explicit self-esteem stays robustly favorable, in part due to both external influences (social norms) and internal influences (self-motives) (Thomaes et al., 2017).

In the current study, we found moderate developmental stability for implicit self-esteem; implicit self-esteem did not change significantly from 5 to 9 years of age (see Table 1). In addition, implicit self-esteem measures reveal self-positivity in large proportions of adult participants (Greenwald & Farnham, 2000), with the implicit self-esteem effects generally being very strongly positive (Bosson, Swann, & Pennebaker, 2000). The current findings of developmental stability of implicit self-esteem and highly positive implicit self-esteem are compatible with the theory that implicit self-esteem may develop in young children in a form that is highly compatible and continuous with that found in adults (Baron & Banaji, 2006; Cvencek et al., 2016).

Limitations and future directions

Four limitations argue for caution in interpreting these results. First, this was a typically developing sample of children with generally low levels of depression and anxiety. Before the current results can be generalized to broader samples, they warrant replication in more diverse child samples, including those with greater representation of children with clinically meaningful depression and anxiety. Given our objective of identifying early markers of depressive and anxiety symptoms (i.e., before those become clinical levels of depression and anxiety), we designed our study to longitudinally examine typically developing children, some of whom may end up developing those symptoms (in our sample, this was the case for 2.5% who showed evidence of clinically meaningful depressive symptoms and for 28.9% who demonstrated clinically meaningful anxiety symptoms). The use of a nonclinical sample represents a *conservative* test of our hypotheses, and symptom levels in the sample are what would be expected in a community-based sample of children at the age we tested. Even under those conservative conditions, we were able to demonstrate the usefulness of implicit–explicit discrepancies as early markers of depressive symptoms (and this was true even when excluding the data of participants who had clinically meaningful CDI scores; see Tables S2 and S3 in supplementary material). Implicit–explicit discrepancies may be even more effective for early identification of internalizing problems with clinical samples. In addition, a combination of implicit and explicit child measures helped to overcome "same reporter bias," as evident by the finding that CDI and MASC scores, although correlated, were nevertheless differentially predicted by implicit–explicit discrepancies.

Second, although it is possible that the longitudinal correlation is simply reflecting an association with unmeasured depressive symptoms at 5 years of age, that seems unlikely given that depressive symptoms are relatively uncommon at age 5. In early childhood, depression affects approximately

2% of children (Anderson & Mayes, 2010; Calzada, Barajas-Gonzalez, Huang, & Brotman, 2017), thereby making it unlikely that the preexisting internalizing psychopathology played a significant role in the current findings. However, internalizing problems have been shown to emerge over time from subclinical symptoms (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000), and pathways to later internalizing problems appear to start in early childhood with important downstream consequences on multiple areas of functioning (Daniel, Rodrigues, & Jenkins, 2019), thereby highlighting the need for the development of early screening tools.

Third, two waves of data were available, and not all measures were administered at both waves. Without assessing explicit self-esteem and/or internalizing problems at baseline, our ability to understand changes in symptoms over time is admittedly limited. Our study used the best measures available at the time it was conducted because self-report measures of explicit self-esteem did not exist for children as young as 5 years when this longitudinal project was started; such explicit measures have now appeared in the literature (Cimpian, Hammond, Mazza, & Corry, 2017; Harris, Donnellan, & Trzesniewski, 2018). Consequently, it would be useful to replicate and extend this work using a larger battery of tests that includes newly available measures. At the same time, the reported evidence of longitudinal discrepancies (between age 5 and age 9) being more predictive of depressive symptoms than concurrently measured discrepancies (at age 9) suggests that combining implicit and explicit measures to examine implicit–explicit discrepancies offers a valuable new approach that might be useful in developing and validating future markers for the emergence of depression in children at younger ages than typically possible. A future longitudinal investigation of implicit–explicit discrepancies that involves repeated assessment of psychopathology would allow examination of the direction of association between changes in implicit–explicit discrepancies and depressive symptoms and would also contribute to a more comprehensive understanding of the developmental course of self-esteem in childhood.

Fourth, one of the two statistical approaches used in this study used difference scores to assess implicit–explicit discrepancies. There has been a recent debate over whether a specific use of difference scores obtained from multiple informants can meaningfully improve predictions of criterion variables over and above its component scores. As some authors have suggested, difference scores can present both statistical and interpretive challenges, sometimes leading to ambiguous conclusions about study findings (Laird & De Los Reyes, 2013). At the same time, there are at least three empirical reasons that favor the use of difference scores in the current case. First, difference scores have proven to be very useful when test–retest reliability of measures is high (e.g., changes in height or weight are excellent measures when height or weight is measured with accurate scales or rulers). Second, even when test–retest reliability is not so high, difference measures can be very useful, especially when obtained within the same individual (Williams & Zimmerman, 1996). More specifically, the conclusion of reduced reliabilities of difference scores depends on assumptions of equal variance of the measures used to compute difference scores and high correlation between those two measures. Neither of these assumptions is appropriate for the implicit and explicit self-esteem measures with the same participants used here because (a) implicit self-esteem measures were more variable than explicit measures (see Table 1) and (b) none of the implicit–explicit correlations was statistically significant (see Table S1 in supplementary material). Third, many well-established psychological measures are in difference score form, including *signal detection measures* (based on differences between hit and false alarm rates in perceptual tasks), *electrophysiological measures* (e.g., electroencephalography [EEG] measures of event-related potentials based on differences in voltage readings; functional magnetic resonance imaging [MRI] measures based on differences in blood flow indicated by MRI), and *implicit attitude measures* (e.g., the IAT based on differences in latencies between the IAT's two combined tasks). This does not mean that all difference scores are optimal measures. For example, posttest–pretest measures of attitude change are typically inferior to analyses of posttests with pretest used as a covariate. Future work on implicit–explicit discrepancies as developmental markers of internalizing problems will benefit from the use of advanced statistical procedures, which have been used in recent work on informant discrepancies, such as latent class analysis (Makol & Polo, 2018) and polynomial regression (Becker-Haimes, Jensen-Doss, Birmaher, Kendall, & Ginsburg, 2018).

Broader implications

The current results suggest that the appearance of depressive symptoms in children is associated with implicit–explicit discrepancies and not just lower levels of explicit self-esteem (e.g., van Tuijl et al., 2014) or lower levels of implicit self-esteem (e.g., Franck, De Raedt, Dereu, et al., 2007). It seems to be the *direction and discrepancy* across time that are particularly informative, such that discrepancies between early implicit representations and later explicit reports of self-worth reflect a developmental pathway associated with elevated risk for depressive symptoms. These findings suggest that implicit–explicit discrepancies may be an early marker of risk for depression. After this research was started, explicit self-esteem measures were developed for use with children aged 5 and 6 years (Cimpian et al., 2017; Harris et al., 2018). By combining such measures with ours, we may be able to examine implicit–explicit discrepancies early in development to determine whether it is the discrepancy early in development or the change in this discrepancy over time that is most strongly related to depression. Taken together, the results suggest that merely focusing on enhancing children's explicit self-esteem might not be enough. Additional focus should be given to the conditions and mechanisms that cause discrepancies between children's implicit and explicit self-esteem. This might contribute to improvements in early screening and detection of children at risk for depression—a condition that is often chronic and associated with substantial impairment and disability.

Acknowledgments

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jecp.2020.104962.

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