



# The Clinical Relevance of Divergence in Adolescent–Parent Reports of Adolescent Depression and Anxiety

Sara F. Stein<sup>1</sup> · Quyen M. Ngo<sup>2</sup> · Elizabeth A. Austic<sup>3</sup> · Philip T. Veliz<sup>4</sup> · Sean Esteban McCabe<sup>4</sup> · Carol J. Boyd<sup>4</sup>

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## Abstract

This study examines associations between adolescent problem behaviors and adolescent–parent disagreement in ratings of adolescent depression and anxiety symptoms. Adolescent–parent dyads ( $N = 463$ ; mean age = 12.68 years; 48.5% female; 78.2% White and 21.8% non-White) reported on adolescent depression and anxiety using parallel scales from the Youth Self Report (Achenbach et al., *J Emot Behav Disord* 10:194–203, 2002) and the Child Behavior Checklist (Achenbach and Rescorla, *The manual for the ASEBA school-age forms & profiles*, University of Vermont, Research Center for Children, Youth, and Families, Burlington, 2001) across four waves. Generalized estimating equations were used to examine the relationship between discrepancy scores and adolescent behavioral outcomes: incidence of adolescent past-year substance use (alcohol use, binge drinking, marijuana use, and nonmedical use of controlled medications), delinquency, self-harm behavior, and aggression. Findings showed that larger adolescent–parent divergence scores of depression were associated with higher odds of marijuana use, non-medical use of controlled medications, alcohol use, binge drinking, in-school delinquency, illegal behavior, self-harm behavior, and clinically significant levels of aggressive behavior. Results further revealed that larger divergence scores on anxiety were associated with higher odds of in-school delinquency, illegal behavior, self-harm behavior, and clinically significant levels of aggressive behavior. Adolescent–parent reporting discrepancy on adolescent’s depression and anxiety symptoms may be indicative of adolescent’s social, emotional, and behavioral problems, and the disagreement may signal further need for assessment of the adolescent.

**Keywords** Adolescents · Adolescent–parent reporting discrepancy · Depression · Anxiety · Behavior problems

The prevalence of mood disorders like anxiety and depression among adolescents is endemic (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Merikangas et al., 2010; Wade, Cairney, & Pevalin, 2002; Woodward & Fergusson, 2001) and is associated with a host of problem behaviors including delinquency, aggression, and substance use

(Diamantopoulou, Verhulst, & van der Ende, 2011; Ferguson, Lynskey, & Horwood, 1996; Ferguson, San Miguel, & Hartley, 2009; Hale, Raaijmakers, Muris, van Hoof, & Meeus, 2008; Woodward & Fergusson, 2001). This has a financial impact on society, with estimated annual costs of mental health totaling \$317 billion in the United States (Insel, 2008). Although adolescent- and parent-report is a well-accepted method for assessing mood disorders in youth, discrepancies in reporting within this informant-dyad have been found (Achenbach, 2006). Many past studies have seen this disagreement as a problem rather than as a source of information (Brewer, Bowen, Smith, Marlatt, & Potenza, 2010). However, recent findings have indicated that these informant discrepancies reveal important information on adolescent’s psychopathology and functioning (De Los Reyes, 2011; De Los Reyes & Kazdin, 2006), including being able to predict negative outcomes in ways that individual reports may not (De Los Reyes, Goodman, Klierer, & Reid-Quinones, 2010). Even so, little attention in the

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✉ Quyen M. Ngo  
qen@umich.edu

<sup>1</sup> Department of Psychology, School of Social Work, Injury Center, University of Michigan, Ann Arbor, MI, USA

<sup>2</sup> Department of Emergency Medicine, Injury Center, Institute for Research on Women and Gender, University of Michigan, 2800 Plymouth, Suite B10-G080, Ann Arbor, MI 48109, USA

<sup>3</sup> Department of Emergency Medicine, Injury Center, University of Michigan, Ann Arbor, MI, USA

<sup>4</sup> School of Nursing, Institute for Research on Women and Gender, University of Michigan, Ann Arbor, MI, USA

literature has been given to understanding the meaning of the degree of this reporting disagreement for adolescent depression and anxiety and resulting negative outcomes, particularly substance use. The present study examines this issue of degree of informant discrepancy in reporting on adolescent depression and anxiety symptoms and the relationship to negative outcomes, including self-harm, substance use, delinquent behavior, and clinically significant levels of aggression.

Onset of mood problems typically occurs during adolescence (Beesdo, Knappe, & Pine, 2009; Lewinsohn et al., 1993), with prevalence rates suggesting that up to 25% of these youth meet criteria for a mental health disorder (Merikangas et al., 2010). Evidence further indicates that approximately 31% of adolescents meet criteria for an anxiety disorder and 14% for mood disorders, including major depressive disorder (MDD) and dysthymia (Merikangas et al., 2010). In youth, anxiety and depression can manifest as irritability, hostility, and fear (American Psychiatric Association, 2000) and have been linked to significant behavior problems including aggression, delinquency (Bubier & Drabick, 2009; Diamantopoulou et al., 2011; Ferguson et al., 2009; Woodward & Fergusson, 2001), and substance use (Witkiewitz & Bowen, 2010; Woodward & Fergusson, 2001).

Clinical interviews are the primary assessment tool used to make mental health diagnoses for depression and anxiety in adolescents. Although adolescents are able to provide crucial information to aid in clinical diagnoses, evidence indicates that this report alone on mental health and functioning does not provide sufficient information to reach robust diagnostic conclusions for treatment (Achenbach, 2006). Assessment of depression and anxiety in adolescents, therefore, requires a multi-informant approach, gathering data from individuals with different information and perspectives (De Los Reyes et al., 2015; Kraemer et al., 2003). Informants generally include the adolescent and at least one primary caregiver, but will extend to multiple caregivers and other important adults in the adolescent's life (including teachers, coaches, etc.) when possible.

Extant literature examining multi-informant reporting on adolescent mental health has shown significant disagreement between reporters (De Los Reyes et al., 2015). In a foundational meta-analysis of 269 samples in 119 studies, Achenbach, McConaughy, and Howell (1987) found high levels of discrepancy between reporters, with a mean scale score correlation of 0.25 between self-parent reports. This finding has since been consistently replicated (De Los Reyes & Kazdin, 2005). For example, in a national sample of youth in the United States, Achenbach et al. (2002) examined differences in adolescent functioning over a 10-year time span, comparing youth, parent, and teacher assessments of youth functioning using the Youth Self Report (YSR), Child Behavior Checklist (CBCL), and Teacher Report Form (TRF). The

CBCL and YSR are well established, validated, and reliable measures of youth functioning that can provide multi-informant data on a range of psychological and behavioral functioning in adolescents. Results revealed cross-informant score correlations between 0.20 and .36 and self-parent score correlation of 0.38. Although this mean correlation significantly exceeded the 0.25 found in the foundational study (Achenbach et al., 1987), the continued low level of association indicates that a large portion of the variance in scores across informants did not overlap.

Many past studies have seen disagreement between informants as a problem that should be resolved by weighting one informant's responses more than another (Brewer et al., 2010). However, more recent findings have shown that discrepancies in reporting do not necessarily reflect problematic or invalid information from one of the informants (Achenbach et al., 1987), but rather provide more data on the adolescent from different contexts and perspectives (Achenbach, 2006). In fact, informant discrepancies have been found to reveal important information on adolescent's psychopathology and functioning (De Los Reyes, 2011; De Los Reyes & Kazdin, 2006).

Studies have shown that adolescent-parent reporting discrepancies can be predictive of negative outcomes in ways that individual reports cannot (De Los Reyes et al., 2010; Ferdinand, Van der Ende, & Verhulst, 2004, 2006; Gaylord, Kitzmann, & Coleman, 2003). Kendall et al. (1997) were the first in the field to examine the predictive validity of child-parent reporting discrepancy. Using a structured interview to assess parent and child perceptions of child anxiety (children ages 9–13 years;  $n = 190$  children), parent-child disagreement was found to be associated with slower improvement in anxiety symptoms compared to dyads with greater agreement. Similarly, De Los Reyes et al. (2010) revealed that high levels of child-mother discrepancy on perceptions of parental monitoring were related child delinquency, above and beyond other control variables.

The magnitude of this adolescent-parent reporting discrepancy is examined in the literature, albeit only recently. In one study, lower levels of problematic externalizing behaviors were significantly associated with the degree of child-mother reporting discrepancy for negative relationship quality and youth self-disclosure (Reidler & Swenson, 2012). However, this was not the case with reporting on internalizing symptoms and adjustment, where results indicated that it was the informant-specific reports that were most relevant, not the discrepancy scores. Thus, much remains unknown about the significance of the degree of adolescent-parent reporting discrepancy for predicting adolescent's behavior problems. Furthermore, this study used a cross-sectional design and a predominantly white sample, limiting both the conclusions of and the generalizability of the findings. Additional research using prospective

longitudinal design is needed to better understand the relationship between the magnitude of adolescent–parent reporting discrepancy for depression and anxiety, and poor outcomes including delinquent and aggressive behavior, self-harm, and substance use/misuse.

Research on discrepancies in adolescent–parent reporting scores has also examined the importance of one of the members of the dyad reporting higher scores than the other. Using a Dutch sample of 636 adolescents and their parents, Ferdinand et al. (2004) followed the adolescents from ages 15- to 18-years old to 19- to 22-years old to examine negative outcomes associated with discrepancy scores including future police/judicial contact, expulsion from school/job, suicidal ideation, deliberate self-harm, referral to mental health services, behavioral/emotional problems, need for help without receiving it, alcohol use, tobacco use, and drug use. Findings revealed that deliberate harm to self and referral to mental health services was predicted by adolescents reporting more anxious/depressed symptoms than their parents, however these results did not hold when other predictors were included in their model (Ferdinand et al., 2004). Furthermore, no behavioral outcomes were significantly associated with parents reporting higher anxious/depressed symptoms than their adolescents. This finding suggests that it may not be the direction of the difference score that is most salient, but rather the magnitude of the disagreement in predicting adolescent's negative outcomes. Similar results were found in another study among 11- to 18-year-olds who were referred for psychiatric treatment in the Netherlands (Ferdinand et al., 2006). However, both studies are limited in that they collapsed anxiety and depression into a single mood discrepancy score, limiting the understanding of reporting discrepancies for these two unique psychopathologies. Although often comorbid, anxiety and depression may be associated with distinct characteristics including hyperarousal, low positive affectivity, and important brain differences in error-monitoring and award-processing (Bress, Meyer, & Hajcak, 2015; Mineka, Watson, & Clark, 1998; Turner & Barrett, 2003) and thus, warrant separate examination. Further research is needed to understand the relationship between potential negative behavioral outcomes and reporting discrepancies separately for adolescent depression and anxiety.

This study had four aims: The first aim was to understand the relationship between the degree of adolescent–parent reporting discrepancy on adolescent's depressive symptoms and the adolescent's problem behaviors (including marijuana use, non-medical prescription drug use, alcohol use, binge drinking, in-school delinquency, illegal behavior, self-harm, and clinically aggressive behavior). The second aim was to examine the relationship between the magnitude of discrepancy scores for adolescent anxiety and the problem behaviors listed for the first aim. The third aim was to determine if

it mattered who in the dyad reported more depressive symptoms for adolescent outcomes. The fourth aim examined this same question for anxiety symptoms. Based on the extant empirical findings reviewed-above and the study aims, the following hypotheses were tested.

## Hypotheses

1. The degree of discrepancy on depression scores would be positively associated with higher incidence of adolescent past-year substance use (marijuana use, nonmedical use of controlled medications, alcohol use, and binge drinking), delinquency (in-school and illegal behavior), self-harm behavior, and clinically significant levels of aggression.
2. The degree of discrepancy on anxiety scores would also be positively associated with these same negative outcomes.

## Research Questions

1. Do adolescent negative outcomes (substance use, delinquency, self-harm behavior, and clinically significant levels of aggression) differ based on who in the adolescent–parent dyad reported more depressive symptoms?
2. Do these same adolescent negative outcomes differ based on who in the adolescent–parent dyad reported more anxiety symptoms?

## Methods

### Participants and Study Design

Study participants represent a sub-sample of adolescent–parent dyads ( $N=463$ ) from the Secondary Student Life Survey (SSLS), a larger National Institute of Drug Abuse funded longitudinal study of 5217 adolescents (Boyd, McCabe, Cranford, & Young, 2006; McCabe, Boyd, Young, & Crawford, 2004). The SSLS was conducted during the 2009–2010, 2010–2011, 2011–2012, and 2012–2013 school years within five secondary public schools in the metropolitan area of southeastern Michigan. The SSLS, a web-based survey, was conducted on an annual basis during the fall months and took approximately 40 min to complete. The survey was maintained on a hosted secure Internet site running under a secure sockets layer protocol to ensure safe transmission of data. The relevant Institutional Review Board approved the study, a Certificate of Confidentiality was obtained from the

National Institutes of Health, and active parental consent and adolescent assent were obtained.

The average response rate across the four waves of data was roughly 68% with a 4-year retention rate of 75% among adolescents who were eligible to participate in all four waves of the study (adolescents who were in 7th, 8th, and 9th grade during the first wave of data collection during the 2009–2010 school year). This compares favorably with *The Monitoring the Future* study of substance use among secondary school adolescents in the United States (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016; Miech et al., 2017).

The current study is based on a sub-sample of the SSLS that included the parents and their adolescents: parents of adolescents who were in the seventh and eighth grades during the 2009–2010 school year and whose adolescents had participated in the first wave of the web survey were invited to participate in the study. The consent form for the adolescent–parent dyad section of the study contained four decisions that had to be endorsed by the parents: (1) if their adolescent could take part in an interview study, (2) if their adolescent could be taped during the interviews, (3) if the parent was willing to complete the *CBCL/6-18* (Achenbach & Rescorla, 2001) on an annual basis, and (4) if study staff could request follow-up information from the school in the event the adolescent moved out of the district during the first wave of data collection (2009–2010 school year). Accordingly, among the 959 adolescents eligible to participate in the adolescent–parent dyad section of the study during the 2009–2010 school year, 463 adolescent–parent dyads consented to participate (48% of the eligible sample). There were no differences by sex or age between adolescents whose parents agreed to participate in the adolescent–parent dyad section of the study (48.5% were female and the mean age was 12.68) and those whose parents declined to participate in this part of the study (51.9% were female and the mean age was 12.66), however, a higher percent of White than non-White adolescents participated in the adolescent–parent dyad study (78.2 vs. 67.2%, respectively).

Among the present sub-sample of 463 adolescent–parent dyads, 274 participated at wave 1 (2009–2010 school year), 357 participated at wave 2 (2010–2011 school year), 413 participated at wave 3 (2011–2012 school year), and 357 participated at wave 4 (2012–2013 school year). Moreover, 316 adolescent–parent dyads participated in three or four waves, while 147 participated in one or two waves of the adolescent–parent dyad section of the study.

## Measures

### Depression and Anxiety Divergence Scores

Adolescent depression and anxiety symptoms as reported by the parent were assessed with the CBCL (Achenbach & Rescorla, 2001). The YSR (Achenbach et al., 2002), a parallel self-report measure of child behavioral and emotional problems, was used to examine depressive and anxiety symptoms as reported by the adolescent. Both the CBCL and YSR have been tested cross-culturally and have excellent reliability and validity (Achenbach & Rescorla, 2001). The depression and anxiety divergence scores were separately computed through taking the absolute value of the difference between the YSR (adolescent) the CBCL (parent) raw score, indicating the degree of difference between the two scores, but not whether the parent or the adolescent had the higher score.

### Higher Depression and Anxiety Symptom Reporter

Two separate categorical variables were created (one for depression and one for anxiety) to identify the higher symptom reporter in the adolescent–parent dyad. A value of 0 was assigned to dyads with perfect symptom agreement, 1 to dyads where adolescents reported more symptoms than their parent, and 2 to dyads where the parent was the higher reporter. Adolescents and parents who had perfect agreement served as the reference category.

### Self-harm

Self-harm behavior was measured using the CBCL and YSR item: “I deliberately try to hurt or kill myself”. The variable was transformed into a dichotomous variable: responses of “often true” and “sometimes true” were given values of 1 (“sometimes or often true”) and 0 (“not true”). If a value of 1 was found in either the YSR or CBCL, it was treated as an indicator of adolescent self-harm behavior.

### Marijuana and Non-medical Use of Controlled Medications

Drug use over the past-year was measured using items from the CBCL and YSR. Marijuana use was assessed by asking, “On how many occasions in the past 12 months have you used marijuana?” and respondents were assigned a value of 1 (use) or 0 (no use) for this binary measure. Non-medical use of controlled medications was assessed by asking, “On how many occasions in the past 12 months have you used the following types of medicines not prescribed to you”. These questions were asked separately for opioid analgesics, stimulants, anxiolytics, and sleeping medications (average Cronbach's  $\alpha$  across the four waves = 0.627). Respondents were assigned values of 1 (use) if they reported use of one



or more of these controlled medications and 0 (no use) if use of none of the four was endorsed.

### Alcohol Use/Binge Drinking

Alcohol use over the past-year was measured using items from the CBCL and YSR, and was assessed by asking, “On how many occasions in the past 12 months have you drank alcohol?”. Responses were assigned a value of 1 (alcohol use) or 0 (no alcohol use). Binge drinking, was measured over the past two weeks; participants were asked, “Over the past two weeks, on how many occasions have you had five or more drinks in a row?”. Responses were assigned a value of 1 (engaged in binge drinking) if they endorsed engaging in this behavior at least once or 0 (did not engage in binge drinking) if they did not.

### Delinquent Behavior

Delinquent behavior over the past year was examined separately for in-school delinquency and for illegal behavior. In-school delinquency was measured by asking respondents, “On how many occasions in the past 12 months have you received...”: asked separately for detention, suspension, and “other forms of school discipline” (average Cronbach’s  $\alpha$  across the four waves = 0.706). Endorsement of any form of in-school discipline was assigned a value of 1 (in-school delinquency) and 0 (no in-school delinquency), if no punishment was reported. Illegal behavior was assessed by asking, “In the past year, have you done any of the following things?...”: asked separately for “Stole something”, “Sold things that were not yours”, “Purchased alcohol or drugs”, “Stole alcohol or drugs”, “Sold drugs or alcohol”, “Gambled”, “Used fake identification”, and “Beat someone up” (average Cronbach’s  $\alpha$  across the four waves = 0.894). Endorsement of any of these activities was assigned a value of 1 (illegal behavior) or 0 (no illegal behavior), if no illegal activity was reported.

### Clinically Significant Levels of Aggressive Behavior

Following the guidelines established by Achenbach and Rescorla (2001), clinically significant aggressive behavior was defined as aggressive behavior from the YSR or CBCL DSM scales that fall above the 69th percentile (relative to a non-clinical sample of same-age adolescents). A binary summary variable was computed to indicate clinically aggressive behavior: 1 (clinically significant) for above the 69th percentile and 0 (not clinically significant) for below the 69th percentile.

### Data Analysis

For the present study, the analysis is divided into two major sections. First, a presentation of the descriptive statistics of the control variables, key independent variables and dependent variables were provided in order to examine some of the characteristics of the sample ( $n = 463$  adolescent–parent dyads) across the four waves of the study. Second, logistic generalized estimating equations (GEE) with an unstructured correlation matrix (this was selected in order to maintain the full sample) and robust standard errors were used to assess how adolescent–parent disagreement among depression and anxiety symptoms (i.e., divergence scores and the categorical measures assessing whether disagreement was higher for parents or adolescents) were associated with several types of problem behaviors across the four waves of the study. The GEE approach accounts for the correlation of repeated measures within the same individual over time and provides flexibility to retain the full sample of respondents (e.g., respondents with only one wave of data can be included in the GEE analysis) (Hanley, Negassa, Edwardes, & Forrester, 2003; Zeger, Liang, & Albert, 1988). Any potential time-invariant discrepancies across waves were accounted for by the inclusion of ‘time’ (i.e. when the adolescent and parent completed the survey) as a control variable in the GEE models. It should be noted that GEE was the optimal approach given the study questions (i.e., the average correlation between the independent and dependent variable during the study period) and the need to retain the full sample based on the unbalanced design of the longitudinal subsample (i.e., not all respondents completed each wave). While other longitudinal approaches were considered (e.g., mixed models), GEE provided the most parsimonious and relaxed analytic model for the outcomes assessed in the current study.

Adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs) were computed for the logistic GEE analyses and provided in the tables. All the logistic GEE analyses controlled for adolescents’ sex, race, and age at the first wave of the study, mother’s highest level of education, whether the adolescent–parent dyad only completed 1 or 2 waves, whether the parent who completed the *CBCL* was male, and when the parent and adolescent completed the survey (i.e., time). Statistical analyses were performed using commercially available software (STATA/SE v.13; STATA Corp., College Station, TX). No procedures were used to impute missing data (although the total sample used for this study consisted of 463 dyads, 11 were removed due to incomplete data for the GEE analyses).

## Results

### Descriptive Statistics

Table 1 provides the descriptive statistics for the control variables and major independent variables used in the analyses across each wave of the study. Among the sample of 463 adolescents who participated in the adolescent–parent dyad section of the study, 48.4% were female, 59% were age 13 or 14 at the first wave of the study (0.6% were 11 years of age, 40.4% were 12 years of age, 48.6% were 13 years of age, and 10.4% were 14 years of age), 78.2% were White, 21.8% were non-White (17.3% were Black, 1.7% were Hispanic, 2.6% were Asian, and 0.2% were American Indian), and 67% had mothers with a college degree or higher. Across the four waves of the study, 10.3% of the parents who responded to the CBCL were male, with roughly 31.7% of adolescent–parent dyads completing only 1 or 2 waves.

With respect to the major independent variables, roughly 16% of parents reported more depression symptoms than their adolescent indicated and roughly 66% of adolescents reported more depression symptoms than their parent indicated across the four waves of the study (18% of the adolescent–parent dyads have perfect agreement in relation to depression symptoms). The average divergence score for depression across the four waves was 2.98 with an average standard deviation of 3.24. Moreover, roughly 17% of parents reported more anxiety symptoms than their adolescent indicated and roughly 57% of adolescents reported more anxiety symptoms than their parent indicated across the four waves of the study (26% of the adolescent–parent dyads have perfect agreement in relation to depression symptoms). The average divergence score for anxiety across the four waves was 1.73 with an average standard deviation of 1.72.

Table 2 provides the general descriptive statistics for the main dependent variables used in the analyses that measured problem behaviors across the four waves of the study (all are dichotomous variables). Accordingly, the average percent of the sample across the four waves that indicated past-year marijuana use was 8.2%, past-year nonmedical use of controlled medications was 5.3%, past-year alcohol use was 8.6%, binge drinking during the past 2 weeks was 2.4%, past-year delinquency (in-school) was 18.5%, past-year delinquency (illegal behavior) was 21.7%, self-harm behavior during the past 6 months was 7.3%, and clinically-significant levels of aggressive behaviors during the past 6 months was 31.7%.

**Table 1** Descriptive statistics for the control variables and key independent variables across each wave

	Wave 1 (n = 274) Mean/% (SD)	Wave 2 (n = 357) Mean/% (SD)	Wave 3 (n = 413) Mean/% (SD)	Wave 4 (n = 357) Mean/% (SD)
Female <sup>a</sup>	47.8	48.2	48.2	47.6
Non-White <sup>a</sup>	15.3	17.4	20.8	17.1
Were age 13 or 14 at wave 1 <sup>a</sup>	64.6	58.5	60.3	59.1
Mother has a college degree or higher <sup>b</sup>	68.6	65.5	68.5	65.3
Child/parent dyad only completed 1 or 2 assessments <sup>a</sup>	11.7	15.4	24.0	16.8
CBCL was completed	8.5	10.7	10.6	11.0
Parent reported more depression symptoms (higher CBCL score) <sup>b</sup>	16.1	19.4	14.3	15.8
Child reported more depression symptoms (higher YSR score) <sup>b</sup>	60.2	66.4	68.3	67.7
Divergence score for depression ( YSR–CBCL ) <sup>b</sup>	2.30 (2.57)	2.91 (3.02)	3.18 (3.44)	3.56 (3.95)
Parent reported more anxiety symptoms (higher CBCL score) <sup>b</sup>	20.1	16.8	16.4	15.0
Child reported more anxiety symptoms (higher YSR score) <sup>b</sup>	52.70	58.30	55.80	60.40
Divergence score for anxiety ( YSR–CBCL ) <sup>b</sup>	1.62 (1.58)	1.70 (1.75)	1.64 (1.63)	1.97 (1.93)

<sup>a</sup>These variables were used as time-invariant covariates in the GEE analysis

<sup>b</sup>These variables were used as time-varying covariates in the GEE analysis

**Table 2** Descriptive statistics for the dependent variables across each wave

	Wave 1 (n = 274) %	Wave 2 (n = 357) %	Wave 3 (n = 413) %	Wave 4 (n = 357) %
Past-year marijuana use <sup>b</sup>	0.4	5.0	13.1	14.3
Past-year nonmedical prescription drug use <sup>b</sup>	2.6	5.0	6.1	7.6
Past year alcohol use <sup>b</sup>	5.5	5.9	10.2	12.9
Binge drinking during the past 2 weeks <sup>b</sup>	0.7	1.1	3.1	4.5
Past-year delinquency (in-school) <sup>b</sup>	25.5	20.7	15.3	12.6
Past-year delinquency (illegal behavior) <sup>b</sup>	19.3	22.1	22.8	22.4
Past 6 months self-harm behaviors <sup>b</sup>	2.6	7.0	9.4	10.1
Past 6 months clinically aggressive behaviors <sup>b</sup>	32.4	32.5	30.7	31.3

<sup>a</sup>These variables were used as time-invariant covariates in the GEE analysis

<sup>b</sup>These variables were used as time-varying covariates in the GEE analysis

### Depression and Problem Behaviors

Hypothesis one postulated that the degree of discrepancy on depression scores would be positively associated with higher incidence of adolescent past-year substance use (marijuana use, nonmedical use of controlled medications, alcohol use, and binge drinking), delinquency (in-school and illegal behavior), self-harm behavior, and clinically significant levels of aggression. Results revealed full support for the first hypothesis: larger divergence scores of depression (i.e., in parent and adolescent assessments of adolescent depression) were associated with higher odds of past-year marijuana use (AOR = 1.10, 95% CI 1.03, 1.18;  $p < .01$ ), past-year non-medical use of controlled medications (AOR = 1.13, 95% CI 1.06, 1.20;  $p < .001$ ), past-year alcohol use (AOR = 1.15, 95% CI 1.08, 1.22;  $p < .001$ ), binge drinking during the past two weeks (AOR = 1.12, 95% CI 1.03, 1.22;  $p < .01$ ), past-year in-school delinquency (AOR = 1.10, 95% CI 1.05, 1.15;  $p < .001$ ), past-year illegal behavior (AOR = 1.17, 95% CI 1.12, 1.23;  $p < .001$ ), self-harm behavior during the past 6 months (AOR = 1.38, 95% CI 1.29, 1.48;  $p < .001$ ), and clinically-significant levels aggressive behavior over the past 6 months (AOR = 1.29, 95% CI 1.23, 1.36;  $p < .001$ ; see Table 3).

In order to examine the substantive impact of the continuous measure of divergence scores for depression on problem behaviors, an additional set of logistic GEE analyses with the same covariates (not shown in Table 3) examined the odds of engaging in problem behaviors among adolescents who had divergence scores of a 3 or higher for depression. Note: the reference group consisted of adolescents with divergence scores of a 2 or lower for depression; the cutoff of 3 was chosen given that it was the average divergence score for depression across the four waves. Accordingly, adolescents who had divergence scores of a 3 or higher for depression had roughly *one-and-a-half times to two times greater odds* of having engaged in past-year marijuana use (AOR = 1.50, 95% CI 1.01, 2.26;  $p < .05$ ), past-year non-medical use of controlled medications (AOR = 1.68, 95% CI 1.02, 2.85;  $p < .05$ ), past-year alcohol use (AOR = 1.96, 95% CI 1.30, 2.97;  $p < .001$ ), past year in-school delinquency (AOR = 1.65, 95% CI 1.21, 2.05;  $p < .01$ ), past-year illegal behavior (AOR = 1.54, 95% CI 1.15, 2.05;  $p < .001$ ), and clinically-significant levels of aggressive behavior (AOR = 2.19, 95% CI 2.30, 3.69;  $p < .001$ ) during the past 6 months when compared to adolescents who had divergence scores of a 2 or lower for depression (binge drinking during the past 2 weeks was not found to be statistically significant in: AOR = 1.60, 95% CI 0.782, 3.29; non sig.). Moreover, adolescents who had divergence scores of a 3 or higher for depression had roughly *six-and-a-half times greater odds* of having engaged in self-harm behavior (AOR = 6.51, 95% CI

**Table 3** Depression divergence scores and problem behaviors

	Model 1 Past-year marijuana use	Model 2 Past-year non-medical prescription drug use	Model 3 Past-year alcohol use	Model 4 Binge drink- ing during past 2 weeks	Model 5 Past-year delinquency (in-school)	Model 6 Past-year delinquency (illegal behav- ior)	Model 7 Past 6 months self-harm behavior	Model 8 Past 6 months clinically aggressive behavior
	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]
Time	1.92*** [1.61, 2.29]	1.33* [1.05, 1.70]	1.40*** [1.16, 1.70]	1.01 [0.719, 1.41]	0.696*** [0.609, 0.795]	1.03 [0.915, 1.16]	1.12 [0.936, 1.36]	0.854** [0.772, 0.945]
Female	1.26 [0.732, 2.18]	1.27 [0.728, 2.24]	1.14 [0.715, 1.82]	0.985 [0.529, 1.83]	0.576** [0.401, 0.827]	0.408*** [0.288, 0.579]	2.06* [1.10, 3.85]	0.782 [0.549, 1.11]
Non-White	0.802 [0.389, 1.65]	1.69 [0.859, 3.34]	1.03 [0.575, 1.86]	0.816 [0.346, 1.92]	2.33*** [1.52, 3.57]	2.34*** [1.49, 3.69]	1.09 [0.519, 2.31]	2.25*** [1.44, 3.49]
Were age 13 or 14 at wave 1	2.05** [1.18, 3.57]	1.51 [0.848, 2.70]	1.64* [1.00, 2.70]	1.32 [0.679, 2.56]	0.645* [0.453, 0.918]	0.954 [0.673, 1.35]	0.875 [0.481, 1.58]	1.12 [0.795, 1.59]
Mother has a college degree or higher child/ parent dyad only	1.01 [0.561, 1.81]	1.12 [0.575, 2.17]	1.52 [0.931, 2.50]	1.36 [0.717, 2.59]	0.963 [0.688, 1.34]	1.04 [0.749, 1.44]	1.02 [0.562, 1.87]	0.910 [0.680, 1.21]
Completed 1 or 2 assess- ments	2.76*** [1.58, 4.83]	0.752 [0.358, 1.58]	1.35 [0.770, 2.38]	1.65 [0.815, 3.36]	1.54* [1.01, 2.34]	1.23 [0.827, 1.83]	0.999 [0.492, 2.03]	0.962 [0.633, 1.46]
CBCL was completed by a male	0.843 [0.422, 1.68]	0.080* [0.008, 0.808]	1.17 [0.601, 2.30]	0.606 [0.172, 2.13]	1.25 [0.768, 2.06]	1.07 [0.668, 1.71]	0.795 [0.363, 1.73]	1.52 [0.922, 2.50]
Parent reported more symp- toms (higher CBCL score)	0.776 [0.389, 1.55]	0.684 [0.248, 1.89]	2.16 [0.938, 4.97]	2.74 [0.925, 8.15]	1.89* [1.11, 3.22]	0.954 [0.578, 1.57]	0.773 [0.303, 1.97]	1.84** [1.22, 2.78]
Child reported more symp- toms (higher YSR score)	0.991 [0.547, 1.79]	0.941 [0.413, 2.15]	1.37 [0.615, 3.08]	1.06 [0.358, 3.18]	1.31 [0.831, 2.07]	1.01 [0.667, 1.55]	0.885 [0.373, 2.09]	1.08 [0.749, 1.56]
Divergence score ( YSR- CBCL )	1.10** [1.03, 1.18]	1.13*** [1.06, 1.20]	1.15*** [1.08, 1.22]	1.12** [1.03, 1.22]	1.10*** [1.05, 1.15]	1.17*** [1.12, 1.23]	1.38*** [1.29, 1.48]	1.29*** [1.23, 1.36]
	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18	Mean VIF=2.18

$p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

3.60, 11.77;  $p < .001$ ) when compared to adolescents who had divergence scores of a 2 or lower for depression.

Research question one queried whether adolescent negative outcomes (substance use, delinquency, self-harm behavior, and clinically significant levels of aggression) would differ based on who in the adolescent–parent dyad reported more depressive symptoms. Adolescents in dyads where the parent reported more depressive had higher odds of past-year delinquency (AOR = 1.89, 95% CI 1.11, 3.22;  $p < .05$ ) and clinically-significant levels of aggressive behavior

(AOR = 1.84, 95% CI 1.22, 2.78;  $p < .01$ ) compared to adolescents who had perfect agreement with their parents.

### Anxiety and Problem Behaviors

Hypothesis two, which proposed that the degree of discrepancy on anxiety scores would also be positively associated with adolescent past-year substance use (marijuana use, nonmedical use of controlled medications, alcohol use, and binge drinking), delinquency (in-school and illegal



behavior), self-harm behavior, and clinically significant levels of aggression, was partially confirmed. Results indicated that larger divergence scores on anxiety were associated with higher odds of past-year in-school delinquency (AOR = 1.11, 95% CI 1.00, 1.24;  $p < .05$ ), past-year illegal behavior (AOR = 1.14, 95% CI 1.05, 1.24;  $p < .001$ ), self-harm behavior during the past 6 months (AOR = 1.39, 95% CI 1.22, 1.57;  $p < .001$ ), and clinically-significant levels of aggressive behavior over the past 6 months (AOR = 1.30, 95% CI 1.19, 1.42;  $p < .001$ ; see Table 4).

Parallel to the analysis for divergence scores for depression, the substantive impact of the continuous measure of divergence scores for anxiety on problem behaviors was assessed. An additional set of logistic GEE analyses with the same covariates (not shown in Table 4) examined the odds of engaging in problem behaviors among adolescents who had divergence scores of a 2 or higher for anxiety. Note: the reference group consisted of adolescents with divergence scores of a 1 or lower for anxiety; the cutoff of 2 was chosen given that it was the average divergence score

**Table 4** Anxiety divergence scores and problem behaviors

	Model 1 Past-year marijuana use	Model 2 Past-year non- medical prescription drug use	Model 3 Past-year alcohol use	Model 4 Binge drink- ing during past 2 weeks	Model 5 Past-year delinquency (in-school)	Model 6 Past-year delinquency (illegal behav- ior)	model 7 Past 6 months self-harm behavior	Model 8 Past 6 months clinically aggressive behavior
	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]
Time	1.92*** [1.61, 2.28]	1.39** [1.09, 1.77]	1.49*** [1.26, 1.76]	1.08 [0.775, 1.50]	0.733*** [645, 0.833]	1.10 [0.982, 1.24]	1.30** [1.10, 1.54]	0.930 [0.849, 1.01]
Female	1.45 [0.882, 2.38]	1.40 [0.806, 2.46]	1.42 [0.890, 2.27]	1.14 [0.598, 2.17]	0.639* [0.445, 0.918]	0.519*** [0.367, 0.733]	3.04*** [1.63, 5.64]	0.965 [0.688, 1.36]
Non-White	0.923 [0.492, 1.73]	1.49 [0.771, 2.88]	1.07 [0.610, 1.90]	0.866 [0.378, 1.98]	2.30*** [1.49, 3.55]	2.10*** [1.35, 3.24]	0.994 [0.511, 1.93]	1.97*** [1.29, 3.00]
Were age 13 or 14 at Wave 1	1.93* [1.11, 3.37]	1.50 [0.846, 2.65]	1.66* [1.00, 2.76]	1.23 [0.621, 2.46]	0.654* [0.460, 0.932]	0.985 [0.696, 1.39]	0.968 [0.558, 1.68]	1.12 [797, 1.58]
mother has a college degree or higher child/ parent dyad only	0.889 [0.495, 1.59]	1.05 [0.548, 2.01]	1.39 [0.855, 2.26]	1.17 [0.614, 2.23]	0.916 [0.653, 1.28]	1.01 [0.731, 1.40]	0.902 [0.512, 1.58]	0.880 [0.658, 1.17]
Completed 1 or 2 assessments CBCL was completed by a male	2.70*** [1.57, 4.67]	0.893 [0.421, 1.89]	1.48 [0.855, 2.57]	1.68 [0.839, 3.38]	1.58* [1.04, 2.39]	1.34 [0.903, 2.00]	1.33 [0.697, 2.54]	1.07 [0.723, 1.58]
Parent reported more symp- toms (higher CBCL score)	0.885 [0.496, 1.57]	0.102* [0.011, 0.932]	1.20 [0.613, 2.38]	0.625 [0.185, 2.11]	1.22 [0.747, 2.00]	1.18 [0.757, 1.84]	0.904 [0.437, 1.87]	1.48 [0.920, 2.38]
Child reported more symp- toms (higher YSR score)	1.16 [0.558, 2.43]	1.84 [0.691, 4.93]	0.904 [0.435, 1.87]	2.02 [0.686, 5.97]	1.14 [0.709, 1.85]	0.883 [0.570, 1.36]	1.21 [0.469, 3.12]	1.10 [0.774, 1.57]
Divergence score ( YSR– CBCL )	1.04 [0.564, 1.93]	1.96 [0.824, 4.65]	1.03 [0.595, 1.79]	1.21 [0.477, 3.08]	1.10 [0.728, 1.67]	0.829 [0.565, 1.21]	1.18 [0.526, 2.69]	0.980 [0.723, 1.32]
	0.989 [0.793, 1.23]	1.06 [0.927, 1.23]	1.05 [0.917, 1.22]	0.999 [0.794, 1.25]	1.11* [1.00, 1.24]	1.14*** [1.05, 1.24]	1.39*** [1.22, 1.57]	1.30*** [1.19, 1.42]
	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24	Mean VIF=2.24

$p < .05^*$ ,  $p < .01^{**}$ ,  $p < .001^{***}$

for anxiety across the four waves. Accordingly, adolescents who had divergence scores of a 2 or higher for anxiety had roughly *one-and-a-half times to two times greater odds* of having engaged in past-year illegal behavior (AOR = 1.44, 95% CI 1.03, 2.00;  $p < .05$ ) and clinically-significant levels of aggressive behavior (AOR = 1.72, 95% CI 1.32, 2.23;  $p < .001$ ) during the past 6 months when compared to adolescents who had divergence scores of a 1 or lower for anxiety (past-year in-school delinquency was not found to be statistically significant in: AOR = 1.07, 95% CI 0.801, 1.45; non sig.). Moreover, adolescents who had divergence scores of a 2 or higher for anxiety had roughly *two-and-a-half times greater odds* of having engaged in self-harm behavior (AOR = 2.60, 95% CI 1.51, 4.48;  $p < .001$ ) when compared to adolescents who had divergence scores of a 1 or lower for anxiety.

The second research question aimed at whether adolescent negative outcomes (substance use, delinquency, self-harm behavior, and clinically significant levels of aggression) would differ based on who in the adolescent–parent dyad reported more anxiety symptoms revealed no significant results. This means that who the higher anxiety symptom reporter was in the adolescent–parent dyad no did not matter for adolescent outcomes of interest. In other words, this categorical measure of anxiety discrepancy reporting was not found to be statistically associated with adolescent substance use, delinquency, self-harm behavior, or clinically significant levels of aggression (see Table 4).

## Discussion

The current study examined the relationship between adolescent–parent reporting discrepancies for adolescent depression and anxiety and associated behavior problems. Furthermore, this work sought to understand the relevance of the magnitude and direction of these reporting discrepancies for negative adolescent outcomes.

Findings supported the first hypothesis that the degree of adolescent–parent reporting scores for depressive symptoms would be associated adolescent problem behaviors. Results showed that adolescents belonging to dyads with higher divergence scores for depressive symptoms were significantly more likely to report having engaged in past year substance use (marijuana use, nonmedical use of controlled prescription medication, alcohol use, and binge drinking), delinquency (in-school and illegal behavior), self-harm behavior, and clinically relevant aggressive behavior than those with lower scores. In fact, the substantive impact of the magnitude of the reporting discrepancy was evident: adolescents with higher discrepancy scores had greater odds of engaging in substance use (marijuana use, nonmedical use of controlled prescription medication, alcohol use),

delinquency (in-school and illegal behavior), aggression and approximately six-and-a-half times greater odds of having engaged in self-harm behavior than those with lower levels of discrepancy. The significant relationship between the magnitude of discrepancy scores for depressive symptoms and these negative outcomes suggests that these divergence scores are indicative of clinically important psychosocial problems. This finding is supported by prior research that indicates that adolescent–parent reporting discrepancy scores on adolescent psychopathology and functioning captures unique information not obtained through reporting from a single informant (De Los Reyes, 2011; De Los Reyes & Kazdin, 2006; De Los Reyes et al., 2010).

Results partially confirmed the second hypothesis that high discrepancy scores for adolescent–parent report on anxiety symptoms would be associated with problem behaviors. Findings revealed that higher divergence scores were significantly associated with a greater likelihood of reporting having engaged in delinquency (in-school and illegal behavior), self-harm behavior, and clinically relevant aggressive behavior, but not substance use. The substantive impact of the degree of the divergence for anxiety scores was also seen: adolescents in the group with highest discrepancy scores had greater odds of having engaged in illegal behavior and had clinically significant levels of aggressive behaviors and two-and-a-half times greater odds of having engaged in self-harm behavior than those with lower levels of divergence scores. Again, these findings are of clinical relevance for therapy and treatment purposes.

The differences in findings between the depression and anxiety discrepancy scores suggest that there are important differences in the impact of these discrepancy scores on adolescent functioning. However, there are also common findings across depression and anxiety. Divergence in reports of adolescents' depression and anxiety symptoms appear to be relevant to issues of adolescent self-harm behavior and potential suicidality. Laukkanen et al. (2009) found that among 4205 Finnish adolescents, poor relationships between adolescents and parents (as reported by adolescents in response to a question from the YSR) was associated with previous and current self-cutting behaviors, as well as other self-harm behaviors (Laukkanen et al., 2009).

While the main focus of this study was testing for associations between adolescent–parent degree of discrepancy on depression and anxiety scores and problem behaviors, this work also sought to assess whether it mattered if the parent or the adolescent reported more symptoms than the other member in the dyad. Interestingly, whether the parent or adolescent reported more symptoms for depression or anxiety was generally not found to be associated with the problem behaviors assessed in this study. Only adolescents whose parents reported more symptoms of adolescent depression were found to be more likely to have engaged in

in-school delinquency and aggressive behavior. Although this finding has limited overlap with previous findings (Ferdinand et al., 2004, 2006), the present study accounted for the degree of difference (divergence score) in depression and anxiety scores between adolescent–parent dyads and found that this divergence score was a more salient factor in predicting problem behaviors than who in the dyad reported more symptoms of depression or anxiety. Future research assessing the impact of adolescent–parent disagreement should account for the degree of difference in order to assess how this influences various types of problem behaviors.

Overall, the findings in this study contribute the understanding of adolescent indications of depression and anxiety symptoms and how parental assessments of their adolescent's emotion regulation may be related to engagement in problem behaviors. That is, if parents and adolescent children have highly discrepant views of the adolescent's emotional distress, this may be indicative of a stressful adolescent–parent relationship that may be associated with the adolescent's current involvement in problem behaviors such as delinquency and substance use. Agreement in adolescent–parent assessments of adolescent functioning could be indicative of a positive communicative relationship, associated with healthy functioning among adolescents in a community population. When the degree of disagreement in adolescent–parent assessments of depression and anxiety symptoms is accounted for, who reports more symptoms is less important. Ultimately, it may not be a matter of who the higher reporter is in the dyad but rather an issue of parents and adolescents differing in their appraisals of adolescent functioning. This is an important finding for adolescent emotion regulation: few studies have examined the impact of these differences in adolescent–parent assessments of adolescent functioning and the studies that have done so (Ferdinand et al., 2004, 2006) have not controlled for the degree of disagreement.

This study contributes to the literature in several important ways. It is the first study to examine the association between divergence in adolescent–parent assessments of adolescent depression and anxiety and its association with drug use and aggressive behaviors. It is also one of the first studies to examine discrepancies in adolescent–parent assessments of adolescent depression and anxiety and their association with problem behaviors utilizing more current versions of CBCL and YSR measures, which include scales that use DSM-IV diagnostic criteria for measuring depression and anxiety. Additionally, these findings provide a discrete measure of adolescent–parent relationships that contributes to the understanding of the role of depression and anxiety in adolescents' problem behaviors. Finally, it should also be noted that the current study included variables that assess adolescents for a wide range of problems behaviors, such as the nonmedical use of controlled medications.

This study is also unique because it draws from an ethnically diverse community sample in the United States and involves multi-informant assessments (463 matched adolescent–parent dyads). Few studies, to date, are able to include multi-informant assessments, particularly adolescent–parent matched data regarding symptoms associated with DSM-IV diagnoses of depression and anxiety symptoms.

## Limitations

Nonetheless, there were several limitations to note about the study. First, the generalizability of the findings may be limited due to the relatively small sample of school-attending adolescents residing in one region of the United States. Second, there may be potential bias in participant responses due to social desirability effects that could be introduced when assessing sensitive behaviors using self-report and parent-report surveys. Third, the measures of divergence for depression and anxiety may be biased by underestimated error variances, given that these are composite scores that would include measurement error from the parents' scores as well as the adolescents' scores. Fourth, the complicated nature of interpreting analyses of difference scores should be noted (Laird & Weems, 2011); future research should examine additional modeling techniques to mitigate any interpretation discrepancies. Fifth, the categorical variables used to assess the substantial impact of divergence for depression and anxiety were data driven (i.e., using a mean as the optimal cut point for a dichotomous measure) and may create biased estimates. Although the dichotomization of the continuous divergence scores may be problematic, it should be highlighted that this approach was used to simply help interpret the estimates that were calculated from the continuous divergence scores (which are provided in the tables). Finally, although findings from this study revealed a connection between the degree of adolescent–parent reporting discrepancies on depression and anxiety symptoms and certain adolescent problem behaviors, future research is needed to understand the explanatory mechanisms for said discrepancies, including possible connections to maltreatment and abuse.

## Clinical Implications

Clinicians working with adolescents often collect information about the adolescent from multiple informants. This invariably results in differences in the reports of adolescent functioning. Typically, clinicians use their clinical judgment to make sense of these discrepancies, focusing on those pieces of these data that are determined to be most salient to diagnosis and treatment. While this clinical judgment is integral to the successful treatment of adolescents, the present findings suggest that it may not be a matter of

deciding whose version is “best,” but rather understanding what the information illuminates and, therefore, the best clinical course of action. A further potential clinical indication of findings from the Laukkanen et al. (2009), and the present study, is that when reporting discrepancies are identified for adolescent depression and anxiety symptoms, clinicians should screen the adolescent for self-harming behaviors or suicidality. The results of this study highlight that clinicians should consider adolescent–parent reporting discrepancies on adolescent depression and anxiety to be clinically important.

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## Compliance with Ethical Standards

**Conflict of interest** The authors declare that they have no conflict of interest to report.

**Ethical Approval** All authors complied with the APA ethical standards and the study was approved by the University of Michigan Institutional Review Board.

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