

# *Parental perception matters: reciprocal relations between adolescents' depressive symptoms and parental perceptions*

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## **Parental Perception Matters: Reciprocal Relations between Adolescents' Depressive**

### **Symptoms and Parental Perceptions**

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# PARENTS' PERCEPTION AND ADOLESCENTS' DEPRESSIVE SYMPTOMS

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**Parental perception matters: Reciprocal relations between adolescents' depressive symptoms and parental perceptions**

**Abstract**

A large body of research has shown that parents play a vital role in the development of adolescents' depression. However, previous research has overlooked the effects of a potentially critical factor, namely, parental perceptions and beliefs about adolescents' depression. The present study examined whether parental perceptions of an adolescent's depressive symptoms predict longitudinal changes in adolescents' symptoms (i.e., the parental perception effect). The longitudinal relationship between adolescents' depressive symptoms and parental perceptions of the adolescents' symptoms was analyzed in three independent groups of parent-adolescent pairs (in total  $N = 1,228$ ). Parental perception and monitoring effects were found in Studies 1B and 2 only in the depressive mood subscale. While a decreased enjoyment subscale showed a perception effect in Study 1A, we obtained null results from other studies. We synthesized the results by applying meta-analytic structural equation modeling to obtain a more robust estimate. The analysis qualified both perception and monitoring effects in both subscales. Our results suggest that when parents believe that their adolescent child is depressed, adolescents are cognitively biased by their parental perceptions over time, resulting in more severe depressive symptoms.

**Public Significance Statement**

This series of three two-wave studies suggests that when parents perceive their adolescent children are depressed, these perceptions may be transmitted to adolescents over time, relating to an increased depressive mood. Our results suggest that parents should avoid worrying excessively about their children's mental health.

*Keywords:* depressive symptoms, parental perception, self-fulfilling prophecy, adolescents, parenting behaviors

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Depression is one of the most prevalent psychopathological conditions in adolescence (Thapar et al., 2012). Previous research has identified multiple risk and preventive factors for adolescent depression (Lewinsohn et al., 1998). Among various factors, substantial research has demonstrated that family processes play a critical role in adolescent depression. For example, increased risk of depression among adolescents is associated with several factors relevant to family processes, including parenting practices and parents' behaviors (e.g., aggression; Schwartz et al., 2017), parental poor emotion regulation (Wolff et al., 2020), and parental stress (Lin et al., 2017). Parents also play key roles in monitoring/detecting their children's depressive symptoms to ensure that the children can receive appropriate support (e.g., by counselors or psychiatrists), to prevent negative outcomes (e.g., suicide; Shain & Committee on Adolescence, 2016), and to ameliorate adolescents' problematic behaviors and distress (e.g., Ary et al., 1999; De Los Reyes & Ohannessian, 2016).

Despite the large body of literature on family processes and adolescents' depression, researchers have overlooked the possibility that parental *perceptions of their children* can affect adolescents' well-being (for an exception, see Creswell et al., 2006 in a case of anxiety symptoms). Specifically, some parents may have a cognitive bias and over-estimate their children's depressive symptoms; their adolescent children may subsequently develop depressive symptoms more strongly than other children—simply due to the parents'

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perception that their children suffer from depression (Alloy et al., 2001). The current study addressed this hypothesis by analyzing longitudinal data from three independent groups of parent–adolescent pairs.

It has been well accepted that parents may transmit depression vulnerability to their adolescent children (e.g., Goodman et al., 2011). For example, by examining the adolescent–parent dyads, Wolff et al. (2020) found that the more parents engage in impulsive behavior in the presence of negative emotions, the stronger the depressive symptoms their adolescent children experience, suggesting that adolescents' depression may partly be due to parents' increased impulsive behavior when they are distressed. In addition, Lin et al. (2017) reported that parenting stress is a mediator between marital quality and adolescents' depressive symptoms; lower parents' marital quality is associated with increased parenting stress, leading to adolescents' depressive symptoms. Furthermore, Schwartz et al. (2017) reviewed observational studies and reported that certain parenting practices, including a higher frequency of aggression and a lower frequency of positivity, tend to place adolescents at risk for depression. Other past literature suggested that parental affective states, including depressive symptoms, are related to their children's affective reactions and family functioning. Morrow et al. (2021) investigated the relationship between mothers' depressive symptoms and reactions to their children's (7–12 years old) positive affect and found that depressive mothers tend to ignore children's words concerning positive affect. Similarly,



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Feng et al. (2007) reported that mothers' positive affective reactions (e.g., smiling) were positively related to children's positive affective reactions two years later. Gutiérrez-Colina et al. (2017) reported that parents' depressive symptoms are negatively related to adolescents' reports of family cohesion beyond adolescents' own depressive symptoms.

Nonetheless, these prior studies on parent–adolescent dyads have overlooked the potential effects of parental perceptions of their children's mental health, despite the repeated finding that psychological well-being can decline due to others' expectations. For example, Sibicky and Dovidio (1986) noted that, “individuals who are labeled as mentally ill may incorporate others' expectations into their own self-concepts, thereby leading to a further loss of self-control and continued deviant behavior” (p. 148). Furthermore, Alloy (2001) suggested that cognitive vulnerability (e.g., maladaptive beliefs and cognitive distortion), a major risk factor of depression, may be formed in children through the feedback parents provide to their children regarding their competencies (see Goodman & Gotlib, 1999). These researchers point to the likelihood that parents who expect their children to be distressed may communicate with their children in a manner that emphasizes the children's vulnerability, thereby limiting the children's opportunities to gain mastery over their environment (see Percy et al., 2016 for a discussion). In line with this notion, Creswell et al. (2006) examined two-wave longitudinal data and demonstrated that children's anxiety symptoms can increase due to parents' perceptions of their children's anxiety symptoms.

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However, few studies have tested the potential effects of parents' perceptions of adolescents' depressive symptoms. In the context of depression, the relation between adolescents' self-reported measures and parental perceptions of adolescents' distress has been examined and interpreted mostly in the context of multi-information measurement (De Los Reyes et al., 2013), with the aim of demonstrating the validity of adolescents' self-reported depressive symptoms. In this line of work, adolescents' self-reported measures of depressive symptoms are deemed valid if they converge with parental perceptions of their children's reports. Studies have generally revealed a low-to-moderate positive correlation between the two on depressive symptoms (e.g., Ablow et al., 1999; Ehrlich, et al., 2011; Rausch et al., 2017). A recent meta-analytical study also reported a small-to-moderate correlation between parental perceptions and children/adolescents' self-reports on internalizing symptoms (i.e., depressive symptoms) (De Los Reyes et al., 2015).

This multi-informant approach is based on a causal inference that adolescents' symptoms influence parental perceptions of their symptoms, as parents accurately monitor their adolescent children's symptoms (e.g., Milan et al., 2017). The positive correlation between adolescents' and their parents' ratings serves as evidence for this causal relation and supports the validity of the measurement. This multi-informant measurement has been accepted as the best practice for examining the psychological distress or well-being of children and adolescents (De Los Reyes et al., 2015; Dirks et al., 2012). However, as

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indicated in our earlier argument, it is possible that the positive relation between adolescents' psychological distress and parental perceptions of adolescents' psychological distress reflects the reverse causation — when parents consider their children to be displaying depressive symptoms, adolescents' cognition can become biased and they may start developing depressive symptoms.

The actor-partner interdependence model (APIM) is a useful analytical tool to test such potential reciprocal effects. When the APIM is applied to multi-informant longitudinal data, it can test the existence of partner effects (e.g., parental variables predict adolescent variables and vice versa; parental monitoring effect and parental perception effect) while controlling for actor effects (e.g., adolescent variables predict their own outcomes; autoregression). Specifically, the significant cross-lagged path from parental perceptions at Time 1 (T1) to adolescent depressive symptoms at Time 2 (T2; while controlling for autoregression from T1) indicates that parental perceptions relate to adolescents' depressive symptoms beyond the effects of the adolescents' own perceptions (i.e., parental perception effect). Similarly, the APIM can test the opposite effect, in which adolescents' depressive symptoms positively relate to parental perceptions by testing a cross-lagged path (i.e., parental monitoring effect). In summary, there is a need to empirically examine whether parental perceptions of adolescents' depressive symptoms relate to the adolescents' depressive symptoms beyond the latter's own perception by applying APIM to a longitudinal dyad

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dataset.

Another important question concerns the mechanisms underlying the parental perception effect. While the literature on parental perception effects in clinical psychology is sparse, the roles of parental perceptions/beliefs have been intensively examined in the education literature. Over the past several decades, researchers have demonstrated that parental perceptions are significant predictors of adolescent children's educational outcomes beyond the children's own perceptions (e.g., Benner & Mistry, 2007; Bouchey & Harter, 2005; Murayama et al., 2016; for reviews see Wigfield et al., 2015; Yamamoto & Holloway, 2010). Such effects of parental beliefs and perceptions are often considered to be mediated by parenting behavior/involvement; parents can influence their children's outcomes by changing their parenting behavior and adjusting their involvement based on their beliefs and expectations (Wigfield et al., 2015; Yamamoto & Holloway, 2010). In line with these ideas, empirical studies demonstrate that parental expectations affect their child's academic performance through changing the child's beliefs as well as altering their own behavior (e.g., Froiland et al., 2013; Halle et al., 1997).

One of the maladaptive parenting practices implicated in adolescents' mental health is accommodation, which refers to the way in which parents act to diminish or alleviate children's distress caused by a disorder (Lebowitz et al., 2013, 2015). Parents who employ accommodation provide excessive assurance or help to avoid anxiety/distress-provoking

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situations or events. While accommodation may appear to be helpful, such parental behaviors facilitate the maintenance of the children's symptoms via reinforcement processes and, thus, lead to higher levels of anxiety and depressive symptoms in the long term. Recent research reports that accommodation is associated with various disorders, including anxiety and depression (Thompson-Hollands et al., 2014). Thus, parental beliefs and perceptions about adolescent's depression may lead to an increased reliance on accommodation, which may in turn strengthen the adolescent's depressive symptoms over time. Although depression and anxiety are conceptually distinct, and family accommodation has been conceptualized to address maladaptive parenting for anxiety symptoms, depressive and anxiety symptoms are two sides of the same coin (i.e., psychological distress) in that depression can be accompanied by anxiety disorders (Cummings et al., 2014). When cognitive behavioral therapy that is designed to decrease anxiety symptoms is applied to adolescents, the intervention can also ameliorate depressive symptoms (e.g., Ishikawa et al., 2019). Some studies have also shown that adolescents with high accommodation tend to have greater depressive symptoms than those with low accommodation (e.g., Kobayashi et al., 2017; Pontillo et al., 2020).

Parents may not always use maladaptive parenting behavior in response to their beliefs and perceptions of their adolescent children's depression. Instead, they may engage in more positive aspects of parenting, such as involvement and positive reinforcement, which

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may prevent adolescents from developing depressive symptoms. Parental involvement refers to the parents' tendency to be involved in child rearing and school activities. It is one of the central aspects of parenting (e.g., Shelton et al., 1996) and is related to a range of adaptive outcomes for children and adolescents in psychological, behavioral, and academic domains (Brody & Flor, 1998; Castro et al., 2015; Eckshtain et al., 2010; Kawabata et al., 2011; Parent et al., 2014). Similarly, positive reinforcement is another adaptive parenting behavior, representing the degree to which parents show interest in and offer reinforcement for a child's desirable behaviors (e.g., complementing a child when the child does something well; Hoover-Dempsey & Sandler, 2005). Similar to involvement, positive reinforcement has been associated with adaptive outcomes (Hoover-Dempsey et al., 2005; Rogers et al., 2009). For example, a recent study showed that the more parents engaged in positive reinforcement when their adolescent children were aged 13, the better mental health outcomes the children showed 5 years later when they were 18 (Tabak & Zawkadzka, 2017). Thus, when parents engage in involvement and/or positive reinforcement strongly based on their beliefs and perceptions about their adolescent child's depression, it may have a preventive effect on the adolescent's mental health and, subsequently, may weaken the actual depressive symptoms.

### **Current Research**

The central goal of the current study is to examine whether parental perceptions of adolescents' depressive symptoms predict longitudinal changes in depressive symptoms. We

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applied the APIM to three independent two-wave longitudinal datasets, each of which included independent responses from adolescents and their parents on the adolescents' depressive symptoms at two time points. By using the APIM, we sought to tease apart the two separable reciprocal effects underlying the concurrent correlation between adolescents' self-reported depressive symptoms and parental perceptions of adolescents' depressive symptoms: (a) the parental monitoring effect and (b) the parental perception effect.

In Study 1A, we examined whether there is a reciprocal longitudinal relation between parental perceptions and adolescents' depressive symptoms. Study 1B attempted to replicate the findings of Study 1A. Study 2 extended the first two studies by including parenting variables as potential mediators. We examined whether parenting variables mediate the relation between adolescents' depressive symptoms and parents' perceptions of the depressive symptoms. Among the various parenting practices, the aforementioned three types of parenting practices were included as potential mediators: accommodation, parental involvement, and positive reinforcement.

Across all three studies, to provide a stronger basis for causal inference, we controlled for critical confounding factors, namely, socioeconomic status (SES), adolescents' gender, and parental depressive symptoms. Low SES is a risk factor for adolescents' depressive symptoms due to poor access to medical care, stress exposure, and violence (Lorant et al., 2003; Reiss, 2013). Gender is also a significant predictor of adolescents'

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depressive symptoms, such that female adolescents tend to experience more interpersonal life conflicts (Card et al., 2008), are exposed to larger hormonal changes (Albert, 2015), and have a higher risk of developing depressive symptoms than male adolescents (Khesht-Masjedi et al., 2017). Another important factor is parental depressive symptoms, as higher levels of parental depressive symptoms have been reported to be a risk factor for adolescents' depressive symptoms, as described above (Goodman et al., 2011). To examine the effects of parental perception beyond their symptoms, we controlled the effects of parental depressive symptoms.

In sum, we hypothesize that a) parental perceptions will increase adolescents' depressive symptoms, and b) adolescents' depressive symptoms will increase parental perceptions (i.e., reciprocal effects). Further, we hypothesize that parenting practices will mediate the relationship between parental perceptions and adolescents' depressive symptoms.

### **Study 1A**

The first study aimed to examine whether parental perceptions relate to adolescents' depressive symptoms by teasing apart the two reciprocal relations between parental perceptions of adolescents' depressive symptoms and adolescents' depressive symptoms (i.e., the parental monitoring effect and the parental perception effect).

## **Method**

### ***Participants and Procedures***



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The initial sample consisted of 400 pairs of Japanese parents (mothers = 327, fathers = 73) and their adolescent children (junior high school students,  $M_{age} = 14.05$ ,  $SD = 0.81$ ; females = 205, males = 195). The proportions of mothers' age were 30s (11.62%), 40s (72.48%), and 50s (15.90%), and those of fathers were 30s (2.74%), 40s (49.32%), and 50s (46.58%). The participants were recruited from a large nationwide database managed by a Japanese private research firm. The firm owns the database of potential participants recruited via advertising in nationwide newspapers or news magazines. The current participants were randomly selected from the database. We ordered the firm to collect approximately 400 dyads' data based on our maximum budgetary limit. All participants received monetary compensation for their time.

When they agreed to participate in the study, questionnaires were sent to the participants via postal mail for the first wave of data collection (T1). We sent the questionnaires and collected data until the returned questionnaires exceeded 400 dyads. In total, we sent the questionnaire to 580 pairs, and 400 pairs sent it back (69% of the participants). Thus, 400 pairs participated in the survey at T1. Approximately a year after the T1 data collection, all participants were invited to the second wave of data collection (T2); 256 pairs participated in the survey at T2 (mothers = 214, fathers = 42; female adolescents = 122, male adolescents = 134), with an attrition rate of 36%.<sup>1</sup> There were no partial pairs (i.e.,

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<sup>1</sup> We conducted attrition analysis to examine whether parent-adolescent pairs who did not complete the T2 survey ( $N=144$ ) were different from the pairs who participated ( $N=256$ ) in terms of parental perceptions

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observations that contained data only from a parent or a child) in either wave. In both waves, both parents and adolescents were told that they had to complete the questionnaires independently. Parents were also told not to check their child's answers/responses. If parents had multiple adolescent children, they were told to choose whoever they wanted to nominate as a participant. This study was approved by Doshisha University's ethical review board.

### *Adolescents' Depressive Symptoms*

To determine the level of the adolescents' depressive symptoms, the short version of the Depression Self-Rating Scale for Children (DSRS-C; Namikawa et al., 2011) was used; the original (long) version of the DSRS-C was developed by Birmaher (1981) and has been widely used (e.g., Ivarsson et al., 1994). The scale assesses the frequency of the children's depressive symptoms over the past week. The short version of the scale comprises two subscales: five items (all consisting of reverse-score items) concerning decreased enjoyment and activities<sup>2</sup> (e.g., "I look forward to things as much as I used to") and four items regarding depressive mood (e.g., "I think life is not worth living"), each with a three-point Likert scale (1 = "never", 2 = "sometimes" and 3 = "most of the time"). The validity of this scale for Japanese adolescents was demonstrated by Namikawa et al. (2011). For this research, the depressive mood subscale ( $\alpha$  coefficients = .78 and .79, for T1 and T2) and decreased

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or adolescent depressive symptoms. There were no significant differences between the two groups: for parental perceptions of adolescent depressive symptoms (full-scale),  $t(274.4) = 0.48, p = .63$ , for adolescent depressive symptoms (full-scale),  $t(269.2) = 1.40, p = .16$ , parental depressive symptoms,  $t(318.36) = 0.80, p = .42$ ; adolescent gender  $\chi^2(1) = 3.29, p = .07$ ; parent gender  $\chi^2(1) = 1.30, p = .26$ ; and SES  $\chi^2(11) = 11.48, p = .39$ .

<sup>2</sup> For clarity, we refer to this subscale as "decreased enjoyment" hereafter.

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enjoyment subscale ( $\alpha = .78$  and  $.72$ , for T1 and T2) showed acceptable reliability across time points (for full scale  $\alpha = .79$  and  $.78$ , for T1 and T2, respectively). The clinical cut-off point for this scale is 1.78 by receiver operating characteristic (ROC) analysis averaging all items (i.e., full scale; Namikawa et al., 2011).

### *Parental Perception of Adolescents' Depressive Symptoms*

To assess parental perceptions of their child's depressive symptoms, we used the same items as the short version of the DSRS-C but asked the parents to indicate the degree to which each item described their child's state in the past week using a three-point Likert scale (1 = "not at all" to 3 = "always"). The depressive mood sub-scale ( $\alpha = .78$  both for T1 and T2) and the decreased enjoyment sub-scale ( $\alpha = .71$  and  $.74$  both for T1 and T2) showed acceptable internal consistency across both time points (for full scale,  $\alpha = .76$  and  $.76$ , for T1 and T2).

### *Control Variables*

To assess parental depressive symptoms, parents completed the Kessler Psychological Distress Scale (K10; Kessler et al., 2002), which examines how often individuals have experienced depressive symptoms within the past 30 days. The scale has a single factor comprising ten items (e.g., "Did you feel so depressed that nothing could cheer you up?") with a five-point Likert scale (1 = "not at all" to 5 = "always"). The validity of this scale for Japanese adults was demonstrated by Furukawa et al. (2008). For the present study, the scale

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showed high reliability ( $\alpha = .93$  for T1). A previous study suggested that the clinical cut-off score for this scale is 3.5, based on Stratum-Specific Likelihood Ratios (see Furukawa et al., 2003). Further, we obtained demographic information, such as gender and household income. Gender was coded as “0” for females and “1” for males for both adolescents and parents in our analyses. To measure the SES, we asked parents to report their annual household income (1 = < 2,000,000 yen; 2 = 2,000,000–2,999,999 yen; 3 = 3,000,000–3,999,999 yen; 4 = 4,000,000–4,999,999 yen; 5 = 5,000,000–5,999,999 yen; 6 = 6,000,000–6,999,999 yen; 7 = 7,000,000–7,999,999 yen; 8 = 8,000,000–8,999,999 yen; 9 = 9,000,000–9,999,999 yen; 10 = 10,000,000–11,999,999 yen; 11 = 12,000,000–14,999,999 yen; and 12 = 15,000,000 yen or more; Ministry of Education, Culture, Sports, Science and Technology, 2014). The exchange rate between USD and JPY was 1 USD = 121 JPY (March 31, 2022). The mode of SES category in this study was 6 (15.11%)<sup>3</sup>.

### ***Statistical Analysis***

We conducted our main analysis using the APIM with latent variables. In the APIM, in order to clarify the monitoring effect, we predicted parental perception of depressive symptoms (T2) by adolescents' depressive symptoms (T1) controlling for T1 parental perceptions and control variables (i.e., SES, gender of parents and adolescents, parental

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<sup>3</sup> We checked whether the distribution of socioeconomic status (SES) was similar to the past public survey, a large representative sample (via two-stage stratified random sampling) of child-rearing families in Japan (The Japan Institute for Labor Policy and Training, 2017). The result was non-significant  $\chi^2(11) = 4.39, p = .96$ , indicating that our sample was similar to the past survey in terms of SES condition.

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depressive symptoms at T1). In addition, for the perception effect, adolescents' depressive symptoms (T2) were predicted by parental perceptions (T1), controlling for T1 adolescents' depressive symptoms and control variables.

### *Transparency and Openness*

We reported how we determined our sample size, data exclusions, and all measures in the study. All data and analytic code for our main analyses (Studies 1A, 1B, and Study 2) are publicly available at <https://osf.io/8eq5u/>. Data were analyzed using Mplus version 8.4 (Muthén & Muthén 1998–2017). This study's design and its analysis were not pre-registered.

### **Results**

For descriptive statistics, we computed average scores for each scale. In our sample, 86 adolescents (21%) and 10 parents (4%) showed depressive symptoms as indicated by scores above the aforementioned cut-off points at T1, and 60 adolescents (23%) and 6 parents (2%) showed depressive symptoms at T2. Descriptive statistics, including sample size for each variable and correlations, are presented in Tables S1 and S2. Correlations between adolescents' subscales of depressive symptoms were not high across T1,  $r(398) = .34, p < .001$ , and T2,  $r(254) = .38, p < .001$ , indicating that both sub-scales reflect different aspects of depressive symptoms. Parental perceptions of adolescents' depressive symptoms showed a moderate correlation between T1 and T2,  $r(254) = .50, p < .001$ ;  $r(254) = .51, p < .001$  for depressive mood and decreased enjoyment, respectively. Adolescent depressive symptoms

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were also significantly correlated across time,  $r(254) = .48, p < .001$ ;  $r(254) = .50, p < .001$  for depressive mood and decreased enjoyment, respectively. These correlations indicate that both constructs are relatively stable, but display a substantial amount of change (i.e., unaccounted variance) across time. Critically, adolescents' depressive symptoms and parental perceptions of adolescents' depressive symptoms were positively correlated within time points; for depressive mood,  $r(398) = .36, p < .001$  at T1 and  $r(254) = .40, p < .001$  at T2; for decreased enjoyment,  $r(398) = .44, p < .001$  at T1 and  $r(254) = .53, p < .001$  at T2. These findings are consistent with those of previous studies (Ablow et al., 1999; Rausch et al., 2017), and our subsequent analysis (APIM) aimed to examine the potential reciprocal effects underlying the correlations.

### ***Measurement Invariance***

To apply latent variable models, we first tested the longitudinal measurement invariance of our main variables (i.e., adolescents' depressive symptoms and parental perceptions). The analysis was performed with Mplus version 8.4 with full information maximum likelihood estimation (FIML) with robust standard error (Muthén & Muthén 1998–2017). In the model, each measure was hypothesized to contain two factors (depressive mood and decreased enjoyment; Namikawa et al., 2011). We tested three models. In the first model, all parameters were freely estimated. In the second model, we imposed constraints on factor loadings of the same items across time points (e.g., the same item of adolescent depressive

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symptoms at both T1 and T2). In the third model, we constrained factor loadings as with the second model and error variance of the same items. For additional information, the error variance of the same items across both time points and informants were allowed to correlate. For example, an adolescent's report of a depressive symptom item was allowed to correlate across T1 and T2 along with the parent's perception of the focal item at both T1 and T2. In the second and third models, we also constrained and attempted to equalize the concurrent relationship between adolescent items and parent perception of focal items at both time points to avoid model complexity. The models fitted well to the data. For the first model,  $\chi^2(512) = 717.98, p < .001$ , CFI = .95, RMSEA = .03, 90%CI [.03, .04], SRMR = .06, AIC = 15153.54. For the second model,  $\chi^2(535) = 735.47, p < .001$ , CFI = .95, RMSEA = .03, 90%CI [.03, .04], AIC = 15135.87. For the third model,  $\chi^2(553) = 764.38, p < .001$ , CFI = .94, RMSEA = .03, 90%CI [.03, .04], AIC = 15145.32. Since all models had shown almost identical fit to the data, we adopted the most conservative model (i.e., the third model) to ease model complexity and computational demand.

### *The Reciprocal Relations between Parental Perceptions and Adolescent Depressive*

#### *Symptoms*

We reported the APIM results based on each depressive symptom factor to avoid model complexity. We tested the APIM model in which all control variables (adolescent's gender, parent's gender, SES, and parental depressive symptoms) were entered as T1

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predictors. In this model, parental depressive symptoms were estimated as a latent factor<sup>4</sup>.

**Depressive mood.** The model fitted well to the data,  $\chi^2(460) = 799.70, p < .001$ , CFI = .93, RMSEA = .04, 90%CI [.04, .05], SRMR = .06. Although we found the hypothesized pattern of the regression coefficient, we did not find the positive significant relationship between parental perceptions of their child's depressive mood at T1 and adolescents' depressive symptoms at T2 ( $\beta = .13$ , 95%CI [-.05, .32],  $p = .16$ ; parental perception effect) controlling for auto-regression and control variables. In addition, the relationship between depressive mood in adolescents at T1 and parental perceptions of adolescents' depressive mood at T2 was not statistically significant ( $\beta = .13$ , 95%CI [-.04, .31],  $p = .13$ ; parental monitoring effect), controlling for auto-regression and control variables. Please see Figure 1A and Table S3 for more specific information.

**Decreased enjoyment.** For decreased enjoyment, the model fitted well to the data,  $\chi^2(343) = 593.19, p < .001$ , CFI = .94, RMSEA = .04, 90%CI [.04, .05], SRMR = .05. Parental perceptions (T1) showed a positive significant relation to adolescents' decreased enjoyment (T1), ( $\beta = .21$ , 95%CI [.03, .40],  $p = .03$ ), controlling for auto-regression and control variables. The opposite side of the cross-lagged effect (adolescents' decreased enjoyment at T1 to parental perceptions of it at T2; monitoring effect) was not significant ( $\beta = .10$ , 95%CI [-.06, .27],  $p = .22$ ). Please see Figure 1B and Table S4 for more specific

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<sup>4</sup> Since three pairs of parental depressive symptoms items were strongly correlated, we allowed the error variance of those pair items to correlate with each other to enhance model fit.



information.

In addition, we tested a model in which two depressive symptom factors were entered simultaneously; the obtained results were almost identical to the results reported in this section. The results are presented online as supporting information (Table S5).

Although it was not our focus, we also tested whether parental and adolescent genders moderated the cross-lagged effects in which we compared two models: 1) all parameters were fixed across mothers and fathers (or females and males), and 2) the cross-lagged paths were relaxed from Model 1 (e.g., cross-lagged paths are different between the groups). There were no significant model fit differences, meaning that cross-lagged effects were almost identical across mother and father for depressive mood  $\Delta\chi^2(2) = 0.11, p = .95$ , and for decreased enjoyment  $\Delta\chi^2(2) = 1.31, p = .51$ . It was the same for adolescent gender, for depressive mood  $\Delta\chi^2(2) = 2.06, p = .35$ , and for decreased enjoyment  $\Delta\chi^2(2) = 1.02, p = .79$ .

## Discussion

Although the results of Study 1A suggest a parental perception effect, the effect was observed only for the decreased enjoyment subscale of the depressive symptoms. For depressive mood, although the pattern was similar, we did not see any statistically significant results. Although the results provide insight into the potential role of parental perception, the study has several limitations. First, the parent data were provided by mothers for some

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adolescents but by fathers for others; there may be systematic differences between mothers' and fathers' perceptions (Webster-Stratton, 1988). In fact, many existing studies have focused only on maternal reports as parental indicators (e.g., Benner & Mistry, 2007; Pomerantz & Dong, 2006). Second, we had a relatively high attrition rate (nearly 40%). Although this is not surprising for a longitudinal study with pairs, such a high attrition rate may have biased our results. We suspect that these limitations might be a reason for the parental perception effect (in depressive mood) and parental monitoring effect (in both subscales) to be non-significant. Thus, we addressed these limitations and replicated the results in Study 1B.

### **Study 1B**

The main objective of Study 1B was to replicate the results of Study 1A while addressing the limitations of Study 1A. Specifically, in Study 1B, we limited parental participants to mothers to control for the possible effects of gender in parental reports. In Japanese culture, a cultural norm still exists in parenting that husbands work and mothers take care of their families (Shimoda, 2008). Furthermore, mother-child bonds tend to be stronger (e.g., Iyengar & Lepper, 1999). Therefore, it seems reasonable to focus only on maternal effects. In addition, to address the relatively high attrition rate in Study 1A, we a) clarified that participants needed to take part in both T1 and T2 surveys during the recruitment process and b) reduced the time interval between the T1 and T2 surveys to half a year.

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**Method*****Participants***

A total of 408 pairs of Japanese mothers ( $M_{\text{age}} = 44.84$ ,  $SD = 4.49$ ) and their adolescent children (junior high school students,  $M_{\text{age}} = 13.73$ ,  $SD = 0.90$ ; females = 213; males = 195) were recruited from a large nationwide database managed by the same Japanese private research firm as the one used in Study 1A. As with Study 1A, we ordered the firm to collect approximately 400 dyads' data based on our maximum budgetary limit. The firm was instructed to recruit only those participants who could take part in both waves of data collection, which were conducted approximately six months apart. The firm sent the questionnaires to 500 pairs, and 408 pairs returned them. Thus, 408 pairs completed the survey at T1; 373 pairs answered the survey at T2 (female adolescents = 194, male adolescents = 179), with an attrition rate of 8.5%.<sup>5</sup> None of these participants had taken part in Study 1A. As in Study 1A, the SES condition was similar to the past public survey  $\chi^2(11) = 7.58$ ,  $p = .75$ .

***Procedure***

The measures used in Study 1B were identical to those used in Study 1A, except that the K10, which measures parental depressive symptoms, was not included in Study 1B due to

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<sup>5</sup> Those who did not complete the T2 survey were not significantly different from those who completed both the T1 and T2 surveys in terms of either parental perceptions of adolescents' depressive symptoms (full-scale score),  $t(39.33) = 1.42$ ,  $p = .16$  or adolescents' depressive symptoms (full-scale score) at T1,  $t(37.83) = 1.49$ ,  $p = .14$ . It was also non-significant for our control variables; gender  $\chi^2(1) = 0.01$ ,  $p = .94$ ; SES  $\chi^2(11) = 16.11$ ,  $p = .14$ .

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time constraints (Study 1B was a part of a large survey and included other measures). Note that in Study 1A, parental depressive symptoms were not significantly predictive of adolescents' depressive symptoms or of parental perception of the child's depressive symptoms. Mothers and children were asked to fill out the questionnaires independently, enclose the completed questionnaires in two separate envelopes, and seal them independently.

### Results

A total of 93 (23%) and 88 adolescents (24%) showed depressive symptoms as indicated by scores above the cut-off points at T1 and T2, respectively. Descriptive statistics and correlations among variables are presented in Tables S6 and S7. As in Study 1A, parental perceptions of adolescents' depressive symptoms showed a relatively high correlation between time points  $r(367) = .52, p < .001$ ;  $r(369) = .60, p < .001$  for depressive mood and decreased enjoyment, respectively. Adolescents' self-reports on their depressive symptoms were also significantly correlated across the two time points;  $r(369) = .55, p < .001$ ;  $r(369) = .62, p < .001$  for depressive mood and decreased enjoyment, respectively. These correlations indicate that both constructs are relatively stable, but display a substantial amount of change (i.e., unaccounted variance) across time. In addition, as observed in Study 1A, adolescents' depressive symptoms and parental perceptions were positively correlated within time points; for depressive mood:  $r(404) = .45, p < .001$  at T1 and  $r(366) = .50, p < .001$  at T2; for decreased enjoyment:  $r(404) = .52, p < .001$  at T1 and  $r(366) = .55, p$

< .001 at T2.

***Reciprocal Relations between Parental Perceptions and Adolescents' Depressive Symptoms***

For measurement invariance, as in Study 1A, the most stringent model fitted well with the data,  $\chi^2(553) = 795.57, p < .001$ , CFI = .95, RMSEA = .03, 90%CI [.03, .04], SRMR = .06.

**Depressive mood.** The results of the APIM are depicted in Figure 1A. The analytical procedures (including model constraints) were identical to those used in Study 1A. The results reported here are based on data from 408 mother–adolescent pairs.

The model fitted well to the data,  $\chi^2(116) = 162.38, p = .003$ , CFI = .97, RMSEA = .03, 90%CI [.02, .04], SRMR = .05. Stronger parental perceptions of adolescents' depressive mood at T1 were predictive of adolescents' stronger depressive mood at T2 ( $\beta = .22$ , 95%CI [.05, .39],  $p = .01$ ). The opposite cross-lagged effect was also significant, that is, adolescents' higher depressive symptoms at T1 were predictive of higher parental perceptions of adolescents' depressive symptoms at T2 ( $\beta = .26$ , 95%CI [.10, .42],  $p = .001$ ).

**Decreased enjoyment.** The results of the APIM are depicted in Figure 1B. The model showed high model fit.  $\chi^2(189) = 355.13, p < .001$ , CFI = .94, RMSEA = .05, 90%CI [.04, .05], SRMR = .06. For this model, however, we did not find any significant cross-lagged relations, perception effects ( $\beta = .01$ , 95%CI [-.16, .17],  $p = .95$ ), or monitoring effects ( $\beta = .14$ , 95%CI [-.04, .31],  $p = .12$ ). For more specific results pertaining to Figure 2A

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and B, please see Tables S8 and S9. We also tested depressive mood and decreased enjoyment simultaneously in the model. The results were almost identical to the results presented here (Table S10).

**Discussion**

Study 1B was a further examination of Study 1A in an independent sample. For depressive mood, the parental perception effect was significant. Although the results were inconsistent with the findings of Study 1A in terms of statistical significance, the effect size of both studies were positive; moreover, the substantial overlap in 95% CI between the two studies suggests that both effect sizes were relatively similar ( $\beta = .13$ , 95%CI [-.05, .32] for Study 1A and  $\beta = .22$ , 95%CI [.05, .39] for Study 1B). We found a similar pattern of results for the parental monitoring effect ( $\beta = .13$ , 95%CI [-.04, .31] for Study 1A and  $\beta = .26$ , 95%CI [.10, .42] for Study 1B). Thus, the results across the first two studies suggest that while parents monitor their adolescent children's depressive moods and update their perceptions accordingly (i.e., parental monitoring effect), parental perceptions are also significant predictors of the adolescents' depressive mood even after controlling for the effects of the adolescents' depressive mood at a previous time point. For decreased enjoyment, we failed to replicate the findings in Study 1A regarding the parental perception effect. The effect size of this study was almost zero ( $\beta = .01$ ). The monitoring effect was positive across studies, but both were non-significant.

## Study 2

### Objectives and Statistical Analyses

The main goal of Study 2 was to further replicate the findings and to investigate the mechanisms underlying the parental perception effect on adolescents' depressive symptoms. We included the parenting variables (accommodation, parent involvement, and positive reinforcement) and used a mediation analysis to test whether parental perceptions alter parenting behavior/practices, in turn affecting their adolescent child's depressive symptoms either positively or negatively. As in Studies 1A and 1B, we assessed the adolescents' depressive symptoms and their parental perceptions at two time points. By assuming stationarity across time points (i.e., cross-lagged effects are assumed to be the same for the hypothetical following time points), the APIM allows us to estimate the mediation effects (Little et al., 2007). Specifically, the mediating effects in the two-wave cross-lagged data can be estimated by multiplying the following two regression coefficients: (a) parental perceptions of adolescents' depressive symptoms at T1  $\rightarrow$  parenting variables at T2, and (b) parenting variables at T1  $\rightarrow$  adolescents' depressive symptoms at T2 (Ohtani et al., 2020; Weinstein et al., 2017). A significant multiplication effect of (a) \* (b) indicates that parenting variables mediate the relationship between parental perceptions and adolescents' symptoms. In contrast, if significant cross-lagged regression coefficients are not obtained for either (a) or (b), the mediating effects are deemed to be non-significant. Like Study 1A, Study 2 also

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controlled for parental depressive symptoms.

## Method

### *Participants and Procedure*

The initial sample for the T1 data collection included 420 pairs of Japanese mothers ( $M_{\text{age}} = 45.89$ ,  $SD = 4.41$ ) and their adolescent children (junior high school students,  $M_{\text{age}} = 13.59$ ,  $SD = 0.94$  13–15 years; females = 219, males = 201). The recruitment procedure was identical to that used in Study 1B. As with Studies 1A and 1B, we ordered the firm to collect approximately 400 dyads' data based on our maximum budgetary limit. None of the participants in Study 2 took part in Studies 1A or 1B. The questionnaires were sent to 500 pairs, and 420 pairs returned them at T1, and these 420 pairs were invited to participate in the T2 survey; 383 pairs completed the survey at T2 (female adolescents = 202, male adolescents = 191), with an attrition rate of 9%.<sup>6</sup> The interval between T1 and T2 was half a year (identical to Study 1B). As in Studies 1A and 1B, our sample was similar to the past public survey in terms of SES condition,  $\chi^2(11) = 8.07$ ,  $p = .71$ .

### *Measures*

The measures used in Study 2 were identical to those used in Studies 1A and 1B; the descriptive statistics and reliability of the scales are presented in Table 7. We also included

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<sup>6</sup> The results of the attrition analysis were non-significant for parental perception of adolescent depressive symptoms (full-scale score),  $t(28.09) = 1.83$ ,  $p = .08$ ; adolescent depressive symptoms (full-scale score),  $t(30.76) = 1.95$ ,  $p = .06$ ; accommodation,  $t(29.31) = 0.15$ ,  $p = .88$ ; involvement,  $t(29.71) = 0.62$ ,  $p = .54$ ; and reinforcement  $t(28.58) = 1.38$ ,  $p = .18$ . It was also non-significant for our control variables: parental depressive symptoms  $t(28.94) = 1.15$ ,  $p = .26$ ; gender  $\chi^2(1) = 0.93$ ,  $p = .33$ ; SES  $\chi^2(1) = 10.34$ ,  $p = .50$ .



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the following additional measures on parenting styles:

**Accommodation.** To assess the level of parental accommodation, the Family Accommodation Scale-Anxiety (Lebowitz et al., 2013) was used. The scale uses parental self-reports to assess maladaptive parental involvement to prevent children's psychological distress (e.g., anxiety) during the past 30 days. The scale comprises two subscales: four items concerning *participation* (e.g., "How often did you assist your child in avoiding things that might make him/her more anxious?") and four items on *modification* (e.g., "Have you had to do some things that would usually be your child's responsibility?"), with a five-point Likert scale (0 = "not at all" to 4 = "everyday"). For the present study, the participation sub-scale ( $\alpha = .85$  for T1,  $\alpha = .83$  for T2) and modification sub-scale ( $\alpha = .80$  for T1,  $\alpha = .83$  for T2) showed adequate reliability across time points.

**Parental involvement.** To assess parental involvement with adolescent children, we used the involvement subscale of the Positive Negative Parenting Scale (PNPS; Ito et al., 2014). This subscale is based on parents' self-report of the degree to which they engage in communication and shared activities with their children (e.g., "I participate in school activities, such as PTA and parents' day," "My child and I often talk about what happened at school as well as about their friends"). The scale consists of nine items with a four-point Likert scale (1 = "not at all" to 4 = "very true"). The scale showed acceptable reliability across time points ( $\alpha = .76$  for both T1 and T2).

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**Positive reinforcement.** To assess adolescents' perceptions of positive reinforcement, the Reinforcement subscale of the Parent Involvement Project Questionnaire (PIPQ; Whetsel et al., 2002) was used. This subscale taps adolescents' reports of their parents' use of reinforcement for their behaviors related to the educational domain (e.g., "My mother shows me that she likes it when I keep working on homework even when I don't feel like it"). The scale comprises 13 items with a four-point Likert scale (1 = "Not at all" to 4 = "Very true"). The scale showed high reliability across time points ( $\alpha = .95$  for T1 and  $\alpha = .96$  for T2).

## Results

Descriptive statistics are presented in Table S11. In our sample, 98 adolescents (23%) and 21 parents (5%) had depression scores above the cut-off point at T1, and 84 adolescents (22%) and 13 parents (3%) showed depressive symptoms above the cut-off scores at T2. All variables showed significant correlations between T1 and T2 (Table S12); adolescent depressive symptoms for depressive mood,  $r(380) = .42, p < .001$ , for decreased enjoyment,  $r(380) = .66, p < .001$ ; parental perceptions of adolescents' depressive symptoms for depressive mood,  $r(385) = .53, p < .001$ , for decreased enjoyment,  $r(382) = .55, p < .001$ , modification,  $r(388) = .55, p < .001$ , participation,  $r(386) = .51, p < .001$ , involvement,  $r(388) = .79, p < .001$ , and positive reinforcement,  $r(377) = .58, p < .001$ . As in Studies 1A and 1B, these correlations indicate that both constructs are relatively stable but display a

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substantial amount of change (i.e., unaccounted variance) across time. In addition, consistent with our results in Studies 1A and 1B, adolescents' depressive symptoms and parental perceptions of adolescents' depressive symptoms were positively correlated within time points; for T1 depressive mood,  $r(415) = .38, p < .001$ , for T1 decreased enjoyment,  $r(415) = .55, p < .001$ , and for T2 depressive mood,  $r(377) = .35, p < .001$ ,  $r(374) = .46, p < .001$  at T2.

*Reciprocal Relations between Parental Perception and Adolescents' Depressive Symptoms*

As in Studies 1A and 1B, we tested the reciprocal relations between parental perceptions of adolescents' depressive symptoms and adolescents' depressive symptoms, while controlling for adolescents' gender and parental depressive symptoms.<sup>7</sup> In addition, to address the main objective of Study 2, parenting behaviors (i.e., accommodation, involvement, and positive reinforcement) were also entered into the model as mediators. The other analytical procedures were identical to Studies 1A and 1B.

**Depressive mood.** First, we tested the model without parenting variables (i.e., the same model as Studies 1A and 1B). The model fit was adequate  $\chi^2(322) = 525.35, p < .001$ , CFI = .95, RMSEA = .04, 90%CI[.03, .04], SRMR = .06. Consistent with the findings of Study 1B, parental perception of adolescents' depressive mood at T1 positively predicted the adolescents' subsequent depressive symptoms at T2 ( $\beta = .28, 95\%CI [.11, .46], p = .002$ ). The

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<sup>7</sup> As we tested the measurement invariance of our main variables with the model identical to Studies 1A and 1B, the model fitted well with the data,  $\chi^2(553) = 716.84, p < .001$ , CFI = .96, RMSEA = .03, 90%CI[.02, .03], SRMR = .06.

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opposite cross-lagged effect was also replicated; that is, stronger depressive mood in adolescents at T1 was predictive of stronger parental perceptions of adolescents' depressive mood at T2 ( $\beta = .21$ ; 95%CI [.07, .35],  $p = .004$ , respectively). Results are presented in Figure 1A; for more detailed information, please see Table S13.

In addition to the above, we estimated the model including parenting variables. Parenting variables were estimated with latent factor structures following the past literature. For measurement invariance of parenting variables, as with depressive symptoms measures, we constrained factor loadings and error variance of the same items across time points and allowed the error variances from the same items to correlate across time points.<sup>8</sup> The model fit of the APIM for depressive mood was  $\chi^2(3,830) = 6431.55$ ,  $p < .001$ , CFI = .87, RMSEA = .040, 90%CI [.039, .042], SRMR = .05. Although the CFI was not very high, considering the complexity of the model, we regarded the model fit as acceptable. For cross-lagged coefficients, none of the parenting variables were significantly predictive of adolescents' depressive mood at T2 (participation:  $\beta = -.03$ ,  $p = .73$ ; modification  $\beta = -.01$ ,  $p = .84$ ; involvement:  $\beta = .00$ ,  $p = 1.00$ ; positive reinforcement:  $\beta = -.01$ ,  $p = .82$ ). Furthermore, parental perceptions of adolescents' depressive mood at T1 did not predict any parenting variables at T2 (participation:  $\beta = .05$ ,  $p = .46$ ; modification:  $\beta = -.03$ ,  $p = .66$ ; involvement:  $\beta$

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<sup>8</sup> The model fit information for the longitudinal measurement invariance test was  $\chi^2(4,549) = 7072.38$ ,  $p < .001$ , CFI = .88, RMSEA = .036, 90%CI [.035, .038], SRMR = .05. The model included our main variables (parental perceptions and adolescents' depressive symptoms) and all parenting variables.

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$=.00, p = .96$ ; positive reinforcement:  $\beta = -.04, p = .45$ ). These results indicate that parenting variables do not mediate the reciprocal interactions between adolescents' depressive mood and their parents' perceptions of their depressive mood. Further, parenting practices did not significantly predict the parental perceptions of adolescents' depressive mood (participation:  $\beta = .02, p = .80$ ; modification:  $\beta = .10, p = .19$ ; involvement:  $\beta = .05, p = .38$ ; positive reinforcement:  $\beta = .01, p = .90$ ). To directly test the mediational processes (i.e., parental perceptions to adolescents' depressive symptoms via parenting variables), the model in which all parenting variables were entered simultaneously was not terminated probably due to model complexity. Therefore, we entered parenting variables one by one. None of the indirect effects were statistically significant ( $ps = .79$  to  $1.00$ ). Additionally, parenting variables were not predicted by adolescents' depressive symptoms at T1 (participation:  $\beta = -.09, p = .14$ ; modification:  $\beta = .06, p = .27$ ; involvement:  $\beta = -.00, p = .95$ ; positive reinforcement:  $\beta = .00, p = .95$ ). The results are presented in Table S13.

Although it was not the focus of the analysis, we observed that the more the parents were depressed at T1, the higher their modification (accommodation) scores at T2 ( $\beta = .14, p = .03$ ). We also found that the three parenting behaviors included in the analysis (modification, involvement, and positive reinforcement) significantly predicted each other. For example, mothers who reported higher scores on positive reinforcement at T1 were more likely to report higher scores on modification ( $\beta = .10, p = .03$ ). Likewise, those who reported

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higher scores on involvement at T1 were more likely to report higher scores on positive reinforcement at T2 ( $\beta = .20, p = .002$ ). These results suggest that parenting behaviors reciprocally related to each other. A summary of the results of parenting variables is presented in Figure 2.

**Decreased enjoyment.** For the model without parenting, the model fit was high  $\chi^2(435) = 676.16, p < .001$ , CFI = .96, RMSEA = .04, 90%CI [.03, .04], SRMR = .05. Parental perceptions of adolescents' decreased enjoyment (T1) did not positively predict adolescents' decreased enjoyment at T2 ( $\beta = .01$ , 95%CI [-.16, .17],  $p = .92$ ). Adolescents' decreased enjoyment (T1) also did not predict parental perceptions of it at T2 ( $\beta = .12$ , 95%CI [-.04, .27],  $p = .14$ ). Results are presented in Figure 1B and Table S14.

We also included parenting variables to test mediation. We imposed the identical constraints on parenting items as in the model for depressive mood. The model fit was comparable to that of depressive mood,  $\chi^2(4191) = 6709.34, p < .001$ , CFI = .88, RMSEA = .038, 90%CI [.036, .039], SRMR = .05. Although the CFI is not very high, considering the complexity of the model, we regarded the fit as reasonable. Adolescents' report of decreased enjoyment was not predicted by parenting variables (participation:  $\beta = .09, p = .12$ ; modification:  $\beta = -.05, p = .47$ ; involvement:  $\beta = -.03, p = .60$ ; positive reinforcement:  $\beta = -.03, p = .61$ ). Parental perceptions of decreased enjoyment (T2) were significantly predicted by modification at T1 ( $\beta = -.15$ , 95%CI [-.28, -.01],  $p = .03$ ) indicating that mothers with a

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higher modification score at T1 tend to respond lower on the perception score of their children's decreased enjoyment at T2. In addition, T1 adolescents' decreased enjoyment significantly predicted participation at T2 ( $\beta = .21$ , 95%CI [.05, .38],  $p = .01$ ), indicating that when adolescents showed decreased enjoyment, parents responded higher on the participation scores. However, we could not find any other significant reciprocal relationships between decreased enjoyment measures and parenting measures. We tested the mediational model in which parenting variables mediate the relationship between parental perceptions and decreased enjoyment. Since the model in which all parenting variables were entered simultaneously was not terminated, we tested the models in which each parenting variable was entered one by one. None of the indirect effects were statistically significant ( $p = .45$  to  $.94$ ). Results are presented in Table S14.

We also tested the model that estimates depressive symptoms subscales simultaneously. The results were almost identical to those as reported above (please see Table S15).

**Discussion**

The main objective of Study 2 was to extend Studies 1A and 1B by examining the roles of parenting variables as mediators. In Study 2, we replicated the results from Study 1B for depressive mood—both the parental perception effect and the parental monitoring effect. For decreased enjoyment, while we did not observe any significant perception and

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monitoring effects, the pattern of the results was consistent with Study 1B. However, we did not find any mediation effects of the parenting variables.

### **A meta-analysis**

In summary, across the three studies, we found similar patterns in depressive mood: the parental perception effect and the parental monitoring effect. In addition, while we found a significant perception effect on the decreased enjoyment subscale in Study 1A, we failed to replicate the significant effect in Studies 1B and 2. For monitoring the effect in this subscale, although the pattern of coefficients was similar (positive), the effects were non-significant in all studies. To obtain more robust effect size estimates of these effects, we conducted a meta-analysis to integrate the results of the three studies we conducted. We applied meta-analytic structural equation modeling (MASEM; Cheung, 2015; Cheung & Chan, 2005). MASEM not only estimates the effect size with a large population as with ordinary meta-analytic procedures, but can also control various covariates and, consequently, compute more valid and reliable estimates (e.g., cross-lagged coefficients) compared to other meta-analytic procedures. We collected relevant data in only these three studies, and did not intend to collect more data after meta-analysis (Ueno et al. 2016). The datasets from all three studies were used for the MASEM.

### **Method**

For each study, we computed a correlational matrix of parental perceptions of



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adolescent depressive symptoms at both T1 and T2, adolescent depressive symptoms at both T1 and T2, and control variables (adolescents' gender, SES, and parental depressive symptoms at T1). We used the same sample that was used in our main analysis (i.e., APIM), meaning that we utilized the data of 400, 408, and 420 pairs from Studies 1A, 1B, and Study 2, respectively. Each latent correlational matrix was obtained using the TECH 4 output in Mplus. As Study 1B did not include the variable assessing parental depressive symptoms, we treated it as missing: MASEM uses FIML to handle missing data. We applied APIM to the pooled correlational matrix as in the previous studies, which estimated cross-lagged coefficients while controlling for auto-regression terms and control variables. The metaSEM package (Cheung, 2015) in R version 4.0.2 (R Core Team, 2020) was used for the analysis.

**Results**

The pooled correlational matrix was estimated based on the fixed effect model with  $N_{\text{pairs}} = 1,228$  participants. The fixed effect model was used because our correlational matrix had a small number of study samples ( $k = 3$ ) and a small between-study variance of path coefficients. As can be seen from the results from each of the three studies, the estimated coefficients were very similar between the studies. This can make the estimation of the between-study variance unstable. For depressive mood, the obtained results supported the parental perception effect, in which parental perceptions of adolescents at T1 positively predicted adolescents' depressive mood at T2 after controlling for the baseline and other

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control variables. The estimated effect size was  $\beta = .21$ , 95%CI = [.16, .27],  $p < .001$ .

Furthermore, adolescents' depressive mood at T1 was a significant positive predictor of parental perceptions of adolescents' depressive mood at T2 after controlling for the baseline and other control variables (parental monitoring effect). The estimated effect size was  $\beta = .20$ , 95%CI [.15, .25],  $p < .001$ . For decreased enjoyment, the result supported the parental perception effect, in which parental perceptions at T1 positively predicted adolescents' decreased enjoyment at T2 after controlling for the baseline and other control variables. The estimated effect size was  $\beta = .07$ , 95%CI [.03, .12],  $p = .003$ . Furthermore, adolescents' decreased enjoyment at T1 was a significant positive predictor of parental perceptions of adolescents' depressive symptoms at T2 after controlling for the baseline and other control variables (parental monitoring effect). The estimated effect size was  $\beta = .12$ , 95%CI [.07, .17],  $p < .001$ . A summary of this result is presented in Figure 1.

## Discussion

By integrating the main findings of the three studies, both the parental perception effect and the parental monitoring effect in depressive mood qualified as statistically significant. Although both the parental perception effect and the monitoring effect were not statistically significant in Study 1A (both  $\beta = .13$ ), this meta-analysis revealed that parental perception has an effect size of  $\beta = .21$  and monitoring has an effect size of  $\beta = .20$ . These results further suggest that the weaker effects observed in our first study could be due to a bias, possibly

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owing to the high attrition rate or interval length (i.e., Study 1A was a year interval). For decreased enjoyment, although we failed to find a significant perception effect (in Studies 1B and 2) and a monitoring effect (across the three studies), the MASEM revealed that both effects were significant. This may indicate that the effect sizes of decreased enjoyment are weaker than those of depressive mood and require more statistical power.

### **General Discussion**

The present study sought to investigate the effects of parental beliefs and perceptions on adolescents' depressive symptoms. Applying the APIM to three independent two-wave longitudinal data from parents and adolescents, we teased apart the effects of adolescents' depressive symptoms on parental perceptions (i.e., the parental monitoring effect) and the effects of parental perceptions on adolescents' symptoms (i.e., the parental perception effect). Both monitoring and perception effects were primarily observed in adolescents' depressive mood domain. Our results demonstrate that while adolescents' self-reported depressive mood predicted parental perceptions of the symptoms (the parental monitoring effect), parental perceptions of adolescents' depressive mood also predicted the increase in self-reported depressive mood in adolescents (the parental perception effect), suggesting that parental perceptions and beliefs are important factors for adolescents' depressive mood.

For the decreased enjoyment subscale, we only found a significant parental perception effect in Study 1A. The monitoring effect was also non-significant in all studies.

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However, both perception and monitoring effects were qualified in the meta-analysis. This indicates that the perception and monitoring effects in decreased enjoyment may not be as tangible as depressive mood. This can be due to the validity of this subscale. To illustrate, the decreased enjoyment subscale consists of only positive items (e.g., I can do things well) and they were reverse coded for the main analysis. Thus, it may not necessarily capture depressive symptoms but rather a positive attribute (e.g., self-esteem). In fact, Namikawa et al. (2011) noted that the test information for this factor was not adequate according to the result of the item response theory. When parents perceive adolescents as mentally healthy, it is likely that they do nothing special for their children because everything goes well. However, when they perceive their children as depressed, they may try to ameliorate their children's state, which can consequently relate to their symptoms (although the mechanism was unclear per the results of the present research).

The present study also examined the mediating roles of parenting variables (i.e., accommodation, involvement, and positive reinforcement) in the relationship between parental perceptions and adolescents' depressive symptoms. However, we did not find any significant cross-lagged paths between the main variables and these parenting variables except the relation between adolescents' decreased enjoyment (T1) and participation (accommodation) at T2. These results suggest that parental perceptions relate to adolescents' depressive symptoms even when parents do not change their parenting practices. Parental

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perception effects may be based on adolescents' cognitive vulnerability to their parents' beliefs and perceptions. For example, when parents perceive their adolescent child as depressed, they may explicitly or implicitly communicate their perceptions and beliefs to their adolescent child; the child in turn would perceive the communicated perceptions (Bouchey & Harter, 2005) and alter their behavior to meet their parents' perceptions (Alloy, 2001; Sibicky & Dovidio, 1986). In addition, when parents perceive their adolescent children as depressed, they may experience and express negative emotional states such as anxiety and worry (cf. Mendenhall & Mount, 2011). Such emotional responses may negatively affect adolescents' emotional states (Aktar & Bögels, 2017; Jaser et al., 2008), in turn leading to higher depressive symptoms. In the present study, we did not assess the pattern of communication between parents and adolescents, or parents' emotional expression when they interact with their adolescent children. Future research should incorporate more observational measures on parent-child interactions (see Brophy & Good, 1970, for example in educational psychology) to fully understand the mechanisms underlying the parental perception effect. Additionally, it is possible that other aspects of parenting variables mediate the parental perception effect. Future studies should use a broader set of parenting variables (e.g., Shelton et al., 1996) to comprehensively examine and understand the potential mediating roles of parenting practices.

The parental perception effect can be interpreted in another way. Specifically, the

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predictive effects of parental perceptions on adolescents' depressive symptoms may reflect parents' remarkable capability to detect the symptoms of their children even earlier than the children themselves. Stated differently, parents may have considerable insight into their children's future conditions even before the children themselves become aware of and report symptoms. Although there is little empirical evidence that suggests this possibility, if this explanation is true, parental reports should be given more credit to evaluate adolescents' depressive symptoms. Future studies should examine this potential alternative explanation of the observed effect.

Another important result from this study concerns the parental monitoring effect. For both depressive mood and decreased enjoyment, we observed an overall significant relationship between adolescents' depressive symptoms and parental perceptions of them (meta-analysis). These results indicate that parents can accurately update their perceptions about their adolescent children based on their symptoms, suggesting the appropriateness of the multi-informant approach to ensure the validity of measurement tools for adolescents' depressive symptoms. At the same time, the existence of the reciprocal relations between parental perceptions and adolescents' symptoms suggests that the simple correlation between adolescents' self-report and parental reports may conflate the parental perception effect, possibly overestimating the causal relation that is assumed in the multi-informant approach.

Two insights can be suggested for the clinical and practical implications of our

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results. First, counselors engaging in therapy for family members might want to pay attention to parental perceptions of their adolescents' symptoms. Since our results suggest that negative parental perceptions can worsen adolescents' depressive symptoms, counselors should be aware of parental perceptions, especially if they disproportionately worry about their children or their perceptions seem biased. Second, parents themselves should be aware of the power of perception. Based on our results, parents are advised not to perceive their children's psychological conditions in an excessively negative manner. Although we focused on parent-child dyads, the perception effect can also occur between other dyads (e.g., wife and husband). In this sense, past literature suggested that similar phenomenon can be observed between counselors and clients (see Sibicky & Dovidio, 1986), meaning that counselors' perceptions can adversely impact clients' psychological symptoms. Thus, counselors should monitor their perceptions, if appropriate. Consultation with senior counselors can be recommended to maintain balance.

It is worthwhile to consider the potential confounders that threaten the validity of our causal inference. Our study used a two-wave longitudinal design, which allowed us to control for various types of time-invariant confounders; additionally, the use of latent variables that controlled for measurement error prevented us from obtaining a spurious causal relationship. Nonetheless, there are multiple factors affecting the cross-lagged relationships. For example, as we only had two time points, we could not use different statistical models that could

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further control for the effects of time-invariant confounders, such as the dynamic panel model or random-intercepts cross-lagged panel model. Moreover, a growth factor may possibly exist that represents a developmental trend in children's depression or parental perceptions of depression. Individual differences in such developmental factors can also bias the causal estimate of the cross-lagged effects. Finally, it is possible that there were some time-invariant confounders that influenced both parents and children over time. For example, if there is a family event that increases depressive symptoms of children as well as parental perceptions about children ("my child should be heavily shocked"), and the latter manifests earlier than the former, the cross-lagged effects can be biased. Future studies should examine this phenomenon by incorporating these potential confounding factors into the model.

Our results should be interpreted while considering cultural differences. Recent cultural psychological perspectives suggest that Japanese individuals tend to be highly sensitive to rejection from others (rejection avoidance) than Americans (Hashimoto & Yamagishi, 2013). Therefore, children might have been sensitive to their parents' reactions, which strongly promoted the parental perception effect. Although we believe our results are common for other cultures since our hypotheses have been based on Western findings (for anxiety symptoms, Creswell et al., 2006), the effect size of perception and monitoring effects can vary across cultures. In addition, while gender inequality is prevalent worldwide, a recent large-scaled survey revealed that Japan ranks low in terms of gender equality (121 out of 153)



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and the gender wage gap is the second largest among OECD countries (*World Economic Forum*, 2019). This results in greater gender inequality in child care obligations in Japan than in Western countries.

There are some important limitations of the present study that need to be noted. First, while the present study revealed a consistent effect across three independent studies, all three studies were based on data collected only at two time points. Recent research on cross-lagged modeling points out the limitation of a two-wave design, suggesting that this design cannot control for a potential confounding factor that contributes to the cross-lagged effects (Usami et al., 2019; Zyphur et al., 2019). Future studies should collect data at more time points and examine more dynamic mechanisms underlying this phenomenon.

Second, the participants for the three studies were recruited from a local community, and we do not know the status of their depressive symptoms based on clinical diagnosis. The results from Studies 1A and 2 suggest that the parent samples were not clinically depressed, as most of them (97% in Study 1A and 95% in Study 2) showed depressive symptom scores below the clinical cut-off. The majority of adolescents also scored below the clinical cut-off on depressive symptoms. Thus, it is unclear whether our results can be replicated in families where parents and/or adolescents are clinically depressed. Likewise, parenting practices may have different effects when parents or adolescents are clinically depressed. In addition, the lack of clinically depressed participants may have resulted in the failure to replicate the

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effects of parental depressive symptoms on adolescents' symptoms as observed in previous literature (Goodman et al., 2011). Future studies should include clinical samples to address these issues.

Third, we relied on self-reported measures. We failed to detect any direct effects of parenting measures in the relationship between parental perceptions and adolescents' depressive symptoms. This may be because the parenting measures were self-reported and likely biased according to the participants' conditions. Future research should utilize direct observation of parenting styles. For depressive symptoms measures, clinical diagnosis can also be applied to avoid a response bias.

Finally, although we hypothesized adolescents' perceptions of parental perceptions (i.e., reflected appraisal; Bouchev & Harter, 2005) in the relation between parental perceptions of adolescents' depressive symptoms and adolescents' depressive symptoms, we did not directly measure adolescents' reflected appraisal. Since it can be a potential mediator between parental perceptions and adolescents' depressive symptoms — when parents perceive adolescents' depressive symptoms, adolescents perceive parental perceptions and consequently show depressive symptoms — empirical support for this process would be necessary.

In conclusion, the present study revealed that parental perceptions relate to adolescents' depressive symptoms beyond the effects of the adolescents' own perceptions.

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The parental perception effect was independent of parenting practices. Thus, our results suggest that when parents believe that their adolescent children are depressed, adolescents can be influenced by parental perceptions over time, resulting in stronger depressive symptoms. Future research in this line may provide unique and novel insights into how parents can prevent their adolescent children from developing depression by altering their own beliefs and perceptions.

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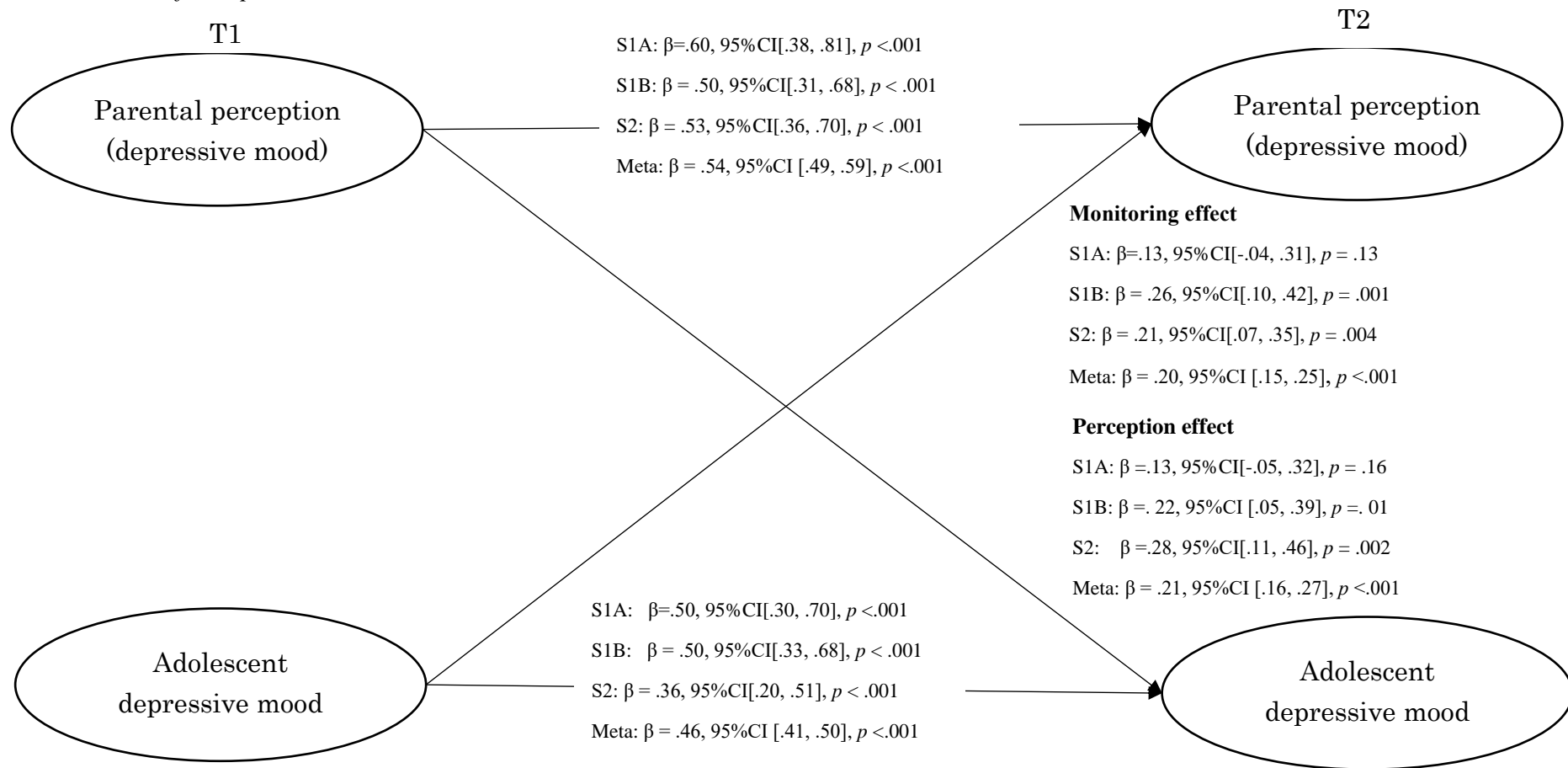
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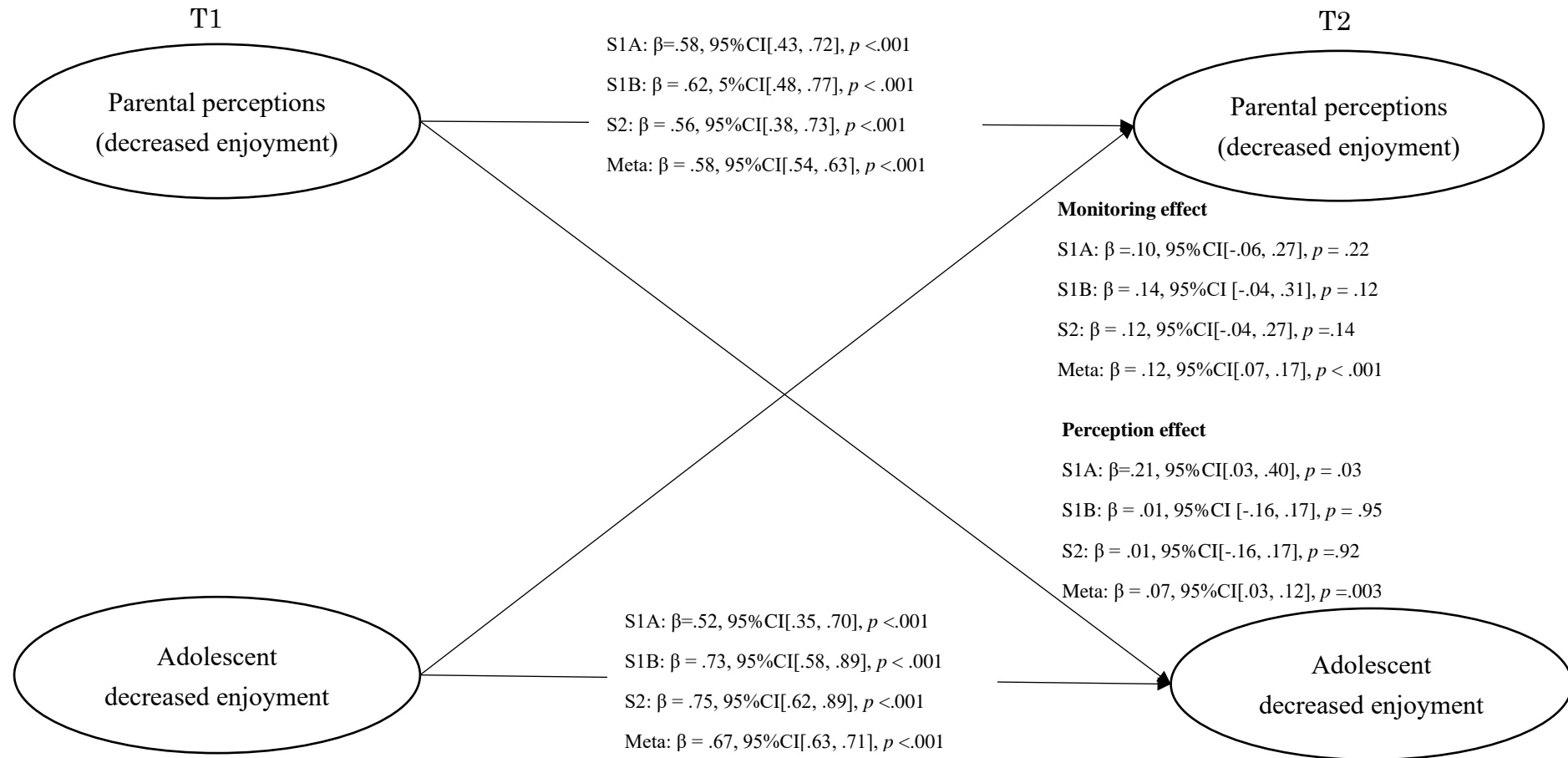
**Figure 1**

*APIM Predicting Adolescents' Depressive Symptoms and Parental Perceptions for Study 1A , Study 1B, Study 2, and the Meta-analysis*

**A : The model for depressive mood**

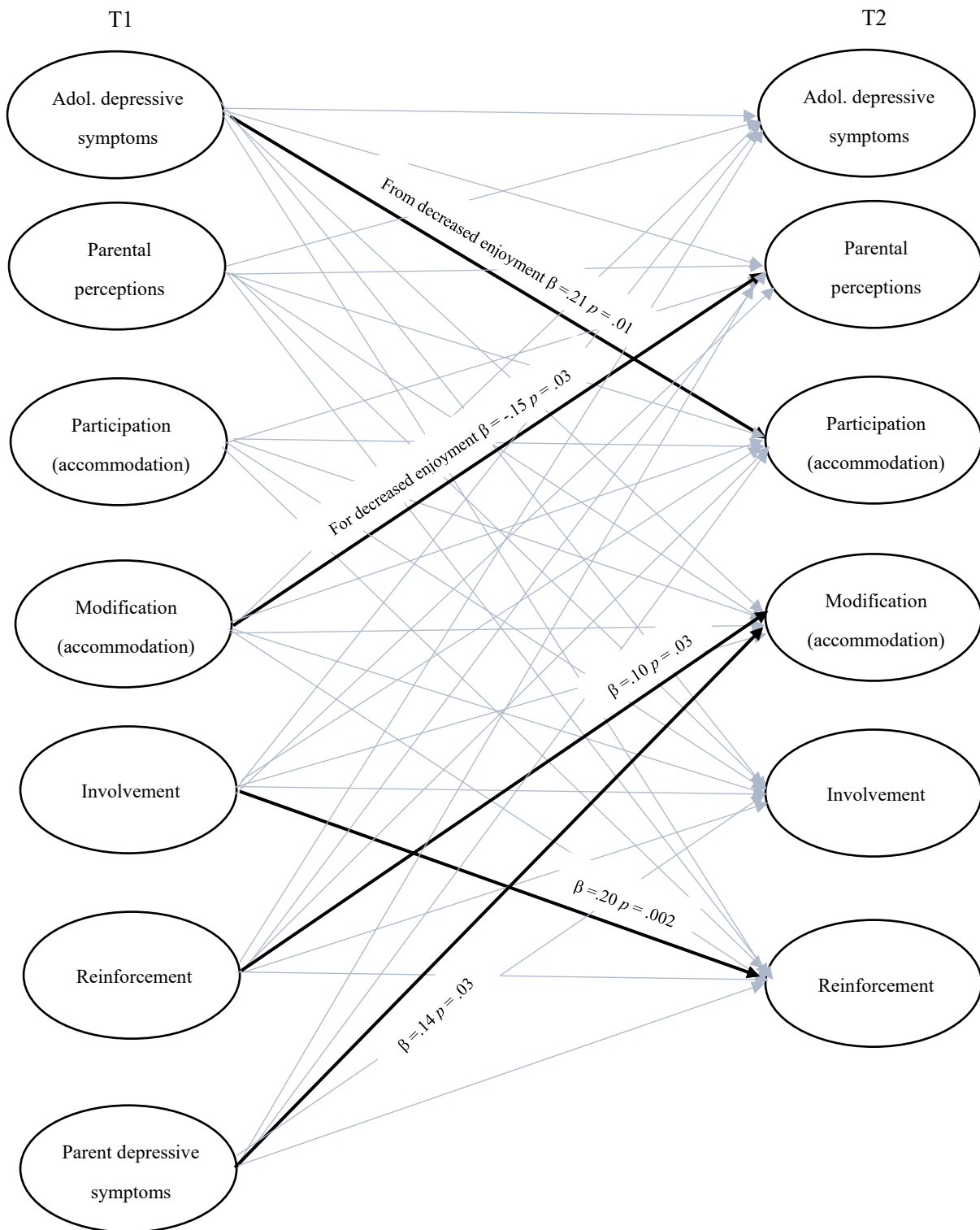


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B: *The model for decreased enjoyment*

*Note.* Control variables for T2 variables were not presented for clarity. Each regression coefficient in Study 1A, Study 1B, Study 2, and the Meta-analysis were presented from the top to bottom. S1A: Study 1A. S1B: Study 1B. S2: Study 2. Meta: Meta-analysis.

## PARENTS' PERCEPTION AND ADOLESCENTS' DEPRESSIVE SYMPTOMS

**Figure 2***Summary Results of the Parenting Variables*

*Note.* Bold paths represent the significant cross-lagged paths. Control variables were not presented for presentational clarity. For the reciprocal relations among parenting variables, regression coefficients are from the depressive mood model (Table S13). Adol; Adolescent

**Table S1***Descriptive Statistics and Reliability of Scales for Study 1A*

	<i>N</i>	Mean	<i>SD</i>	Max	Min	$\alpha$
Parental depressive symptoms (T1)	399	1.65	0.70	5.00	1.00	0.93
Adol depressive mood (T1)	400	1.33	0.43	3.00	1.00	0.78
Adol decreased enjoyment (T1)	400	1.78	0.48	3.00	1.00	0.78
Adol depressive symptoms (full scale) (T1)	400	1.58	0.38	2.89	1.00	0.79
Parental perceptions (depressive mood) (T1)	400	1.21	0.33	3.00	1.00	0.78
Parental perceptions (decreased enjoyment) (T1)	400	1.81	0.39	3.00	1.00	0.71
Parental perceptions (depressive symptoms: Full scale) (T1)	400	1.54	0.30	2.89	1.00	0.76
Adol depressive mood (T2)	256	1.28	0.40	3.00	1.00	0.79
Adol decreased enjoyment (T2)	256	1.82	0.45	3.00	1.00	0.72
Adol depressive symptoms (full scale) (T2)	256	1.58	0.36	2.78	1.00	0.78
Parental perceptions (depressive mood) (T2)	256	1.17	0.30	2.75	1.00	0.78
Parental perceptions (decreased enjoyment) (T2)	256	1.82	0.40	2.80	1.00	0.74
Parental perceptions (depressive symptoms: Full scale) (T2)	256	1.53	0.29	2.56	1.00	0.76

*Note.* Adol: Adolescent.



Table S2

Correlations among Variables for Study 1A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Parental gender	—														
2. Adol gender	.02	—													
3. SES	-.03	-.02	—												
4. Parental depressive symptoms(T1)	-.04	.05	-.02	—											
5. Adol decreased enjoyment (T1)	.04	-.05	-.01	.00	—										
6. Adol depressive mood (T1)	.01	-.12 *	-.01	.10 *	.34 ***	—									
7. Adol depressive symptoms (full scale) (T1)	.03	-.09	-.01	.05	.88 ***	.75 ***	—								
8. Parental perceptions (decreased enjoyment)(T1)	.04	.10 *	-.10	.06	.44 ***	.17 ***	.40 ***	—							
9. Parental perceptions (depressive mood) (T1)	.04	-.14 **	.04	.30 ***	.23 ***	.36 ***	.34 ***	.33 ***	—						
10. Parental perceptions (depressive symptoms: Full scale)(T1)	.05	.00	-.05	.19 ***	.43 ***	.30 ***	.46 ***	.89 ***	.73 ***	—					
11. Adol decreased enjoyment (T2)	.10	-.02	-.04	-.01	.50 ***	.28 ***	.50 ***	.40 ***	.13 *	.36 ***	—				
12. Adol depressive mood (T2)	.03	-.06	-.08	.03	.34 ***	.48 ***	.49 ***	.11	.24 ***	.19 **	.38 ***	—			
13. Adol depressive symptoms (full scale) (T2)	.09	-.04	-.07	.00	.52 ***	.44 ***	.59 ***	.33 ***	.21 **	.35 ***	.89 ***	.77 ***	—		
14. Parental perceptions (decreased enjoyment)(T2)	-.02	.10	-.04	.06	.32 ***	.11	.29 ***	.51 ***	.18 **	.46 ***	.53 ***	.24 ***	.49 ***	—	
15. Parental perceptions (depressive mood) (T2)	-.02	-.07	-.03	.18 **	.18 **	.29 ***	.28 ***	.17 **	.50 ***	.37 ***	.19 **	.40 ***	.33 ***	.30 ***	—
16. Parental perceptions (depressive symptoms: Full scale) (T2)	-.03	.04	-.04	.13 *	.33 ***	.22 ***	.35 ***	.47 ***	.36 ***	.52 ***	.49 ***	.37 ***	.52 ***	.90 ***	.68 ***

Note. Adol: Adolescent. Sample sizes are 252 to 400 across correlations. Significance was based on two-tailed testing.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001.

Table S3

*The Actor-partner Interdependence Model (APIM) Predicting Adolescents’ Depressive Mood and Parental Perceptions for Study 1A*

Adol depressive mood (T2)				Parental perceptions (depressive mood) (T2)		
T1 predictors	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>
Control variables						
Adol gender	-.02	[-.14, .10]	.791	.01	[-.11, .13]	.857
Parent gender	.00	[-.15, .15]	.974	.05	[-.06, .17]	.384
SES	-.10	[-.23, .04]	.150	-.04	[-.16, .07]	.449
Parental depressive symptoms	-.08	[-.20, .04]	.173	-.01	[-.15, .13]	.867
Adol depressive mood	.50	[.30, .70]	<.001	.13	[-.04, .31]	.125
Parental perceptions (depressive mood)	.13	[-.05, .32]	.158	.60	[.38, .81]	<.001
<i>R</i> <sup>2</sup> = .32				<i>R</i> <sup>2</sup> = .43		

*Note.* Adol: Adolescent.

Table S4

The Actor-partner Interdependence Model (*APIM*) Predicting *Adolescents’ Decreased Enjoyment and Parental Perceptions for Study 1A*

T1 predictors	Adol decreased enjoyment (T2)			Parental perceptions (decreased enjoyment) (T2)		
	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>
Control variables						
Adol gender	-.03	[-.15, .09]	.610	.05	[-.07, .16]	.440
Parent gender	-.06	[-.18, .06]	.343	.03	[-.10, .16]	.662
SES	-.01	[-.13, .11]	.844	.06	[-.06, .18]	.304
Parental depressive symptoms	-.05	[-.16, .07]	.436	.00	[-.11, .12]	.945
Adol decreased enjoyment	.52	[.35, .70]	<.001	.10	[-.06, .27]	.224
Parental perceptions (decreased enjoyment)	.21	[.03, .40]	.026	.58	[.43, .72]	<.001
<i>R</i> <sup>2</sup> = .44			<i>R</i> <sup>2</sup> = .42			

*Note.* Adol: Adolescent

Table S5

The Actor-partner Interdependence Model (APIM) Predicting Adolescents’ Depressive Symptoms and Parental Perceptions for Study 1A

Adol depressive mood (T2)				Parental perceptions (depressive mood)(T2)		
T1 predictors	β	95%CI	p	β	95%CI	p
Control variables						
Adol gender	.00	[-.11, .12]	.996	.01	[-.10, .13]	.818
Parent gender	.03	[-.13, .19]	.680	.06	[-.07, .18]	.367
SES	-.12	[-.24, .02]	.082	-.05	[-.16, .07]	.432
Parental depressive symptoms	-.08	[-.19, .03]	.166	-.01	[-.15, .13]	.866
Adol depressive mood	.40	[.19, .61]	<.001	.12	[-.04, .29]	.140
Adol decreased enjoyment	.34	[.13, .54]	.001	.05	[-.12, .22]	.593
Parental perceptions (depressive mood)	.17	[-.03, .37]	.100	.60	[.37, .84]	<.001
Parental perceptions (decreased enjoyment)	-.22	[-.40, -.04]	.017	-.03	[-.20, .14]	.724
R <sup>2</sup> = .40				R <sup>2</sup> = .43		
Adol decreased enjoyment (T2)				Parental perceptions (decreased enjoyment)(T2)		
T1 predictors	β	95%CI	p	β	95%CI	p
Control variables						
Adol gender	-.05	[-.16, .07]	.438	.04	[-.08, .16]	.509
Parent gender	-.07	[-.19, .05]	.276	.03	[-.10, .16]	.674
SES	.00	[-.12, .12]	.976	.06	[-.06, .18]	.289
Parental depressive symptoms	-.01	[-.13, .11]	.858	.01	[-.12, .14]	.885
Adol depressive mood	.18	[.02, .33]	.029	-.00	[-.15, .15]	.989
Adol decreased enjoyment	.46	[.27, .65]	<.001	.10	[-.08, .29]	.274
Parental perceptions (depressive mood)	-.16	[-.33, .01]	.069	-.02	[-.19, .17]	.874

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Parental perceptions (decreased enjoyment)	.27	[.07, .47]	.008	.59	[.42, .75]	<.001
$R^2 = .47$			$R^2 = .41$			

*Note.* Adol: Adolescent.

## PARENTS' PERCEPTION AND ADOLESCENTS' DEPRESSIVE SYMPTOMS

**Table S6***Descriptive Statistics and Reliability of Scales for Study 1B*

	<i>N</i>	Mean	<i>SD</i>	Max	Min	$\alpha$
Adol depressive mood (T1)	407	1.30	0.41	3.00	1.00	0.79
Adol decreased enjoyment (T1)	407	1.82	0.45	3.00	1.00	0.75
Adol depressive symptoms (full scale) (T1)	406	1.59	0.36	2.78	1.00	0.79
Parental perceptions (depressive mood) (T1)	407	1.26	0.36	2.75	1.00	0.77
Parental perceptions (decreased enjoyment) (T1)	407	1.86	0.40	3.00	1.00	0.72
Parental perceptions (depressive symptoms: Full scale) (T1)	407	1.59	0.32	2.78	1.00	0.77
Adol depressive mood (T2)	372	1.31	0.42	3.00	1.00	0.80
Adol decreased enjoyment (T2)	371	1.79	0.45	3.00	1.00	0.74
Adol depressive symptoms (full scale) (T2)	371	1.58	0.37	2.89	1.00	0.80
Parental perceptions (depressive mood) (T2)	369	1.24	0.32	2.75	1.00	0.69
Parental perceptions (decreased enjoyment) (T2)	370	1.86	0.42	3.00	1.00	0.72
Parental perceptions (depressive symptoms: Full scale) (T2)	369	1.59	0.31	2.67	1.00	0.75

*Note.* Adol: Adolescent.

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Table S7

Correlations among Variables for Study 1B

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Adol gender	—												
2. SES	-.04	—											
3. Adol decreased enjoyment (T1)	-.04	-.12 *	—										
4. Adol depressive mood (T1)	-.14 **	-.09	.38 ***	—									
5. Adol depressive symptoms (full scale)(T1)	-.10 *	-.12 *	.89 ***	.77 ***	—								
6. Parental perceptions (decreased enjoyment)(T1)	-.02	-.04	.52 ***	.27 ***	.50 ***	—							
7. Parental perceptions (depressive mood) (T1)	-.16 **	-.05	.29 ***	.45 ***	.43 ***	.38 ***	—						
8. Parental perceptions (depressive symptoms: Full scale)(T1)	-.10	-.05	.51 ***	.41 ***	.57 ***	.89 ***	.76 ***	—					
9. Adol decreased enjoyment (T2)	.02	-.11 *	.62 ***	.32 ***	.60 ***	.37 ***	.19 ***	.36 ***	—				
10. Adol depressive mood (T2)	-.04	-.14 **	.31 ***	.55 ***	.49 ***	.25 ***	.40 ***	.38 ***	.41 ***	—			
11. Adol depressive symptoms (full scale)(T2)	-.01	-.14 **	.58 ***	.50 ***	.66 ***	.38 ***	.33 ***	.43 ***	.89 ***	.79 ***	—		
12. Parental perceptions (decreased enjoyment) (T2)	.06	-.03	.44 ***	.23 ***	.43 ***	.60 ***	.25 ***	.55 ***	.55 ***	.28 ***	.52 ***	—	
13. Parental perceptions (depressive mood) (T2)	-.03	-.11 *	.28 ***	.42 ***	.41 ***	.28 ***	.52 ***	.46 ***	.32 ***	.50 ***	.47 ***	.36 ***	—
14. Parental perceptions (depressive symptoms: Full scale)(T2)	.03	-.07	.46 ***	.36 ***	.51 ***	.57 ***	.42 ***	.62 ***	.56 ***	.44 ***	.60 ***	.91 ***	.72 ***

Note. Adol: Adolescent, SES: socioeconomic status. Sample sizes are 366 to 407 across correlations. Significance was based on two-tailed testing.

\* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.001$

Table S8

The Actor-partner Interdependence Model (*APIM*) Predicting Adolescents’ Depressive Mood and Parental Perceptions for Study 1B

T1 predictors	Adol depressive mood (T2)			Parental perceptions (depressive mood) (T2)		
	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>
Control variables						
Adol gender	.07	[-.03, .17]	.170	.12	[.02, .22]	.022
SES	-.09	[-.18, -.00]	.041	-.07	[-.17, .03]	.178
Adol depressive mood	.50	[.33, .68]	<.001	.26	[.10, .42]	.001
Parental perceptions (depressive mood)	.22	[.05, .39]	.012	.50	[.31, .68]	<.001
<i>R</i> <sup>2</sup> = .42			<i>R</i> <sup>2</sup> = .45			

*Note.* Adol: Adolescent, SES: socioeconomic status.



Table S9

The Actor-partner Interdependence Model (*APIM*) Predicting Adolescents’ Decreased Enjoyment and Parental Perceptions for Study 1B

T1 predictors	Adol decreased enjoyment (T2)			Parental perceptions (decreased enjoyment) (T2)		
	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>
Control variables						
Adol gender	.06	[-.03, .15]	.208	.08	[-.02, .17]	.108
SES	-.02	[-.12, .08]	.686	.01	[-.08, .11]	.802
Adol decreased enjoyment	.73	[.58, .89]	<.001	.14	[-.04, .31]	.123
Parental perceptions (decreased enjoyment)	.01	[-.16, .17]	.953	.62	[.48, .77]	<.001
<i>R</i> <sup>2</sup> = .55				<i>R</i> <sup>2</sup> = .51		

*Note.* Adol: Adolescent, SES: socioeconomic status.

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**Table S10**The Actor-partner Interdependence Model (*APIM*) Predicting Adolescents' Depressive Symptoms and Parental Perceptions for Study 1B

T1 predictors	Adol depressive mood (T2)			Parental perceptions (depressive mood) (T2)		
	$\beta$	95%CI	<i>p</i>	$\beta$	95%CI	<i>p</i>
Control variables						
Adol gender	.07	[-.03, .16]	.191	.11	[.01, .21]	.028
SES	-.09	[-.17, .00]	.054	-.06	[-.16, .04]	.243
Adol depressive mood	.47	[.29, .66]	<.001	.22	[.05, .40]	.013
Adol decreased enjoyment	.07	[-.11, .25]	.462	.11	[-.06, .28]	.213
Parental perceptions (depressive mood)	.21	[.02, .40]	.027	.50	[.29, .71]	<.001
Parental perceptions (decreased enjoyment)	-.00	[-.19, .19]	.988	-.04	[-.21, .14]	.683
$R^2 = .46$			$R^2 = .42$			

## PARENTS' PERCEPTION AND ADOLESCENTS' DEPRESSIVE SYMPTOMS

(continued)

	Adol decreased enjoyment (T2)			Parental perceptions (decreased enjoyment) (T2)		
T1 predictors	$\beta$	95%CI	$p$	$\beta$	95%CI	$p$
Control variables						
Adol gender	.07	[-.03, .16]	.153	.08	[-.02, .17]	.108
Parental depressive symptoms	-.02	[-.11, .08]	.700	.01	[-.08, .10]	.837
Adol depressive mood	.13	[-.03, .29]	.119	.07	[-.07, .21]	.333
Adol decreased enjoyment	.69	[.51, .86]	<.001	.11	[-.09, .31]	.270
Parental perceptions (depressive mood)	-.07	[-.26, .12]	.494	-.07	[-.24, .11]	.445
Parental perceptions (decreased enjoyment)	.02	[-.17, .21]	.824	.65	[.47, .82]	<.001
$R^2 = .51$			$R^2 = .56$			

*Note.* Adol: Adolescent.

## PARENTS' PERCEPTION AND ADOLESCENTS' DEPRESSIVE SYMPTOMS

**Table S11***Descriptive Statistics for Study 2*

	<i>N</i>	Mean	<i>SD</i>	Max	Min	$\alpha$
Parental depressive symptoms (T1)	417	1.86	0.79	4.90	1.00	0.93
Adol depressive mood (T1)	417	1.31	0.39	3.00	1.00	0.74
Adol decreased enjoyment (T1)	419	1.80	0.47	3.00	1.00	0.76
Adol depressive symptoms (full scale) (T1)	416	1.58	0.36	3.00	1.00	0.77
Parental perceptions (depressive mood) (T1)	420	1.23	0.32	2.50	1.00	0.72
Parental perceptions (decreased enjoyment) (T1)	418	1.81	0.38	3.00	1.00	0.72
Parental perceptions (depressive symptoms: Full scale) (T1)	418	1.55	0.30	2.78	1.00	0.76
Accommodation (Modification) (T1)	419	1.61	0.68	4.60	1.00	0.80
Accommodation (Participation) (T1)	417	1.98	0.90	5.00	1.00	0.85
Involvement (T1)	417	2.93	0.49	4.00	1.33	0.78
Positive reinforcement (T1)	416	3.34	0.58	4.00	1.00	0.95
Adol depressive mood (T2)	385	1.32	0.41	3.00	1.00	0.77
Adol decreased enjoyment (T2)	383	1.77	0.47	3.00	1.00	0.78
Adol depressive symptoms (full scale) (T2)	382	1.57	0.37	2.89	1.00	0.80
Parental perceptions (depressive mood) (T2)	387	1.23	0.32	2.50	1.00	0.72
Parental perceptions (decreased enjoyment) (T2)	386	1.80	0.41	3.00	1.00	0.75
Parental perceptions (depressive symptoms: Full scale) (T2)	386	1.55	0.31	2.67	1.00	0.76
Accommodation (Modification) (T2)	389	1.70	0.75	5.00	1.00	0.83
Accommodation (Participation) (T2)	389	2.05	0.89	5.00	1.00	0.83
Involvement (T2)	393	2.88	0.50	4.00	1.33	0.79
Positive reinforcement (T2)	383	3.39	0.57	4.00	1.00	0.96

*Note.* Adol: Adolescent.

Table S12

Correlations among Variables for Study 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Adol gender	—																					
2. SES	-.02	—																				
3. Parental depressive symptoms(T1)	.02	-.14 *	—																			
4. Adol decreased enjoyment (T1)	-.03	-.08	.21 ***	—																		
5. Adol depressive mood (T1)	-.07	-.09	.20 ***	.33 ***	—																	
6. Adol depressive symptoms(full scale)(T1)	-.05	-.10 *	.25 ***	.89 ***	.73 ***	—																
7. Parental perceptions (decreased enjoyment)(T1)	.04	-.06	.18 ***	.55 ***	.22 ***	.51 ***	—															
8. Parental perceptions (depressive mood) (T1)	-.05	-.09	.37 ***	.34 ***	.38 ***	.43 ***	.39 ***	—														
9. Parental perceptions (depressive symptoms: Full scale)(T1)	.01	-.09	.30 ***	.55 ***	.34 ***	.57 ***	.90 ***	.75 ***	—													
10. Accommodation (modification) (T1)	.02	.02	.29 ***	.02	.05	.04	.05	.20 ***	.13 **	—												
11. Accommodation (participation) (T1)	-.07	-.04	.25 ***	.01	.18 ***	.09	.05	.27 ***	.16 **	.43 ***	—											
12. Involvement (T1)	-.14 **	.04	-.11 *	-.20 ***	-.04	-.17 **	-.27 ***	-.06	-.22 ***	.15 **	.26 ***	—										
13. Reinforcement (T1)	-.10 *	.05	-.02	-.24 ***	-.12 *	-.24 ***	-.16 **	-.14 **	-.18 ***	.08	.16 **	.31 ***	—									
14. Adol decreased enjoyment (T2)	.01	-.11 *	.17 **	.66 ***	.29 ***	.62 ***	.40 ***	.35 ***	.46 ***	.01	.06	-.17 **	-.20 ***	—								
15. Adol depressive mood (T2)	-.12 *	-.09	.15 **	.28 ***	.42 ***	.40 ***	.22 ***	.34 ***	.32 ***	.02	.11 *	-.07	-.10	.40 ***	—							
16. Adol depressive symptoms (full scale)(T2)	-.05	-.12 *	.19 ***	.59 ***	.40 ***	.63 ***	.38 ***	.41 ***	.47 ***	.02	.09	-.16 **	-.18 ***	.90 ***	.76 ***	—						
17. Parental perceptions (decreased enjoyment) (T2)	.04	-.06	.12 *	.42 ***	.22 ***	.41 ***	.55 ***	.31 ***	.55 ***	-.06	.02	-.26 ***	-.20 ***	.46 ***	.26 ***	.46 ***	—					
18. Parental perceptions (depressive mood) (T2)	-.01	-.07	.33 ***	.23 ***	.36 ***	.34 ***	.21 ***	.53 ***	.41 ***	.22 ***	.25 ***	.03	-.06	.26 ***	.35 ***	.36 ***	.33 ***	—				
19. Parental perceptions (depressive symptoms: Full scale)(T2)	.03	-.08	.25 ***	.42 ***	.33 ***	.46 ***	.51 ***	.48 ***	.60 ***	.05	.13 **	-.18 ***	-.18 ***	.47 ***	.37 ***	.51 ***	.90 ***	.71 ***	—			
20.Accommodation (modification) (T2)	.02	-.04	.31 ***	.01	.07	.04	.00	.13 *	.06	.55 ***	.33 ***	.09	.14 **	-.04	.04	.00	-.02	.16 **	.06	—		
21. Accommodation (participation) (T2)	-.02	-.03	.24 ***	.10	.04	.09	.03	.15 **	.09	.34 ***	.51 ***	.18 ***	.15 **	.06	.10	.09	.07	.23 ***	.16 **	.55 ***	—	
22. Involvement (T2)	-.18 **	.03	-.04	-.12 *	-.04	-.11 *	-.22 ***	-.03	-.18 ***	.14 **	.27 ***	.79 ***	.30 ***	-.12 *	-.06	-.12 *	-.31 ***	-.04	-.25 ***	.12 *	0.21 ***	—
23. Reinforcement (T2)	.00	.02	-.02	-.15 **	-.08	-.15 **	-.08	-.11 *	-.11 *	.08	.13 *	.31 ***	.58 ***	-.22 ***	-.10 *	-.21 ***	-.17 **	-.07	-.16 **	.09	0.10	0.33 ***

Adol: Adolescent, SES: socioeconomic status. Sample sizes are 375 to 418 across sets of correlations. Significance was based on two-tailed testing.

\**p*<.05, \*\**p*<.01, \*\*\**p*<.001

Table S13

The Actor-partner Interdependence Model (APIM) Predicting Adolescents' Depressive Mood and Parental Perceptions for Study 2

Adol depressive mood (T2)							Parental perceptions (depressive mood) (T2)					
	Model 1 (without parenting)			Model 2 (with parenting)			Model 1 (without parenting)			Model 2 (with parenting)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	-.09	[-.19, .01]	.083	-.09	[-.19, .01]	.073	.04	[-.05, .14]	.389	.05	[-.05, .14]	.326
SES	-.05	[-.15, .04]	.267	-.05	[-.15, .04]	.276	.02	[-.08, .13]	.683	.01	[-.09, .11]	.820
Parental depressive symptoms	-.04	[-.16, .08]	.473	-.03	[-.16, .09]	.602	.07	[-.06, .20]	.291	.04	[-.10, .18]	.570
Adol depressive mood	.36	[.20, .51]	<.001	.35	[.20, .51]	<.001	.21	[.07, .35]	.004	.22	[.08, .36]	.002
Parental perceptions (depressive mood)	.28	[.11, .46]	.002	.29	[.10, .47]	.002	.53	[.36, .70]	<.001	.52	[.35, .70]	<.001
Parenting variables												
Ac_par	—	—	—	-.03	[-.20, .12]	.728	—	—	—	.02	[-.20, .16]	.793
Ac_mod	—	—	—	-.01	[-.14, .11]	.839	—	—	—	.10	[-.05, .24]	.192
Involvement	—	—	—	0	[-.14, .14]	.997	—	—	—	.05	[-.06, .17]	.378
Reinforcement	—	—	—	-.01	[-.13, .10]	.820	—	—	—	.01	[-.09, .11]	.896
R <sup>2</sup> = .30				R <sup>2</sup> = .30			R <sup>2</sup> = .46			R <sup>2</sup> = .49		

Ac_par (T2)				Ac_mod (T2)			Involvement (T2)			Reinforcement (T2)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	.01	[-.08, .11]	.781	.02	[-.07, .11]	.614	-.08	[-.15, -.01]	.030	.09	[.01, .17]	.033
SES	-.01	[-.10, .08]	.767	-.03	[-.11, .06]	.567	.01	[-.06, .08]	.850	-.03	[-.11, .05]	.477
Parental depressive symptoms	.10	[-.02, .22]	.112	.14	[.01, .27]	.033	.00	[-.09, .09]	.984	-.01	[-.11, .09]	.859
Adol depressive mood	-.09	[-.21, .03]	.136	.06	[-.05, .18]	.267	-.00	[-.11, .10]	.954	.00	[-.09, .10]	.947
Parental perceptions (depressive mood)	.05	[-.08, .19]	.457	-.03	[-.18, .11]	.658	.00	[-.12, .12]	.961	-.04	[-.16, .07]	.451
Parenting variables												
Ac_par	.45	[.31, .60]	<.001	.02	[-.13, .17]	.791	.02	[-.09, .13]	.708	-.02	[-.12, .09]	.773
Ac_mod	.13	[-.04, .30]	.145	.56	[.42, .70]	<.001	.01	[-.08, .10]	.801	.02	[-.07, .12]	.651
Involvement	.04	[-.07, .14]	.498	-.02	[-.12, .09]	.744	.79	[.73, .86]	<.001	.20	[.08, .32]	.002
Reinforcement	.04	[-.05, .14]	.389	.10	[.01, .20]	.028	.07	[-.00, .15]	.058	.55	[.45, .65]	<.001
R <sup>2</sup> = .34				R <sup>2</sup> = .42			R <sup>2</sup> = .72			R <sup>2</sup> = .41		

Note. Adol: Adolescent, SES: socioeconomic status.

Table S14

The Actor-partner Interdependence Model (APIM) Predicting Adolescents' Decreased Enjoyment and Parental Perceptions for Study 2

Adol decreased enjoyment (T2)							Parental perceptions (decreased enjoyment) (T2)					
Model 1( without parenting)				Model 2 (with parenting)			Model 1 (without parenting)			Model 2 (with parenting)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	.04	[-.05, .13]	.395	.04	[-.05, .13]	.398	.05	[-.05, .14]	.305	.04	[-.06, .13]	.480
SES	-.04	[-.12, .04]	.360	-.03	[-.12, .05]	.404	-.02	[-.12, .09]	.732	-.01	[-.11, .10]	.903
Parental depressive symptoms	-.00	[-.11, .11]	.979	-.00	[-.12, .11]	.960	.03	[-.10, .15]	.695	.06	[-.07, .18]	.353
Adol decreased enjoyment	.75	[.62, .89]	<.001	.74	[.60, .88]	<.001	.12	[-.04, .27]	.138	.10	[-.06, .25]	.223
Parental perceptions (decreased enjoyment)	.01	[-.16, .17]	.920	.00	[-.17, .17]	.999	.56	[.38, .73]	<.001	.52	[.35, .70]	<.001
Parenting variables												
Ac_par	—	—	—	.09	[-.03, .21]	.124	—	—	—	.11	[-.03, .25]	.108
Ac_mod	—	—	—	-.05	[-.17, .08]	.469	—	—	—	-.15	[-.28, -.01]	.034
Involvement	—	—	—	-.03	[-.16, .09]	.599	—	—	—	-.10	[-.22, .02]	.098
Reinforcement	—	—	—	-.03	[-.12, .07]	.611	—	—	—	-.06	[-.16, .03]	.191
R <sup>2</sup> = .58				R <sup>2</sup> = .58			R <sup>2</sup> = .42			R <sup>2</sup> = .46		

Ac_par (T2)				Ac_mod (T2)			Involvement (T2)			Reinforcement (T2)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	.03	[-.06, .13]	.473	.02	[-.07, .11]	.684	-.07	[-.14, .00]	.050	.10	[.02, .18]	.020
SES	-.00	[-.09, .09]	.957	-.03	[-.12, .06]	.542	.01	[-.06, .08]	.732	-.02	[-.11, .06]	.571
Parental depressive symptoms	.08	[-.04, .19]	.208	.15	[.03, .26]	.014	-.02	[-.10, .07]	.690	-.03	[-.13, .07]	.524
Adol decreased enjoyment	.21	[.05, .38]	.013	.04	[-.12, .20]	.600	.10	[-.01, .22]	.085	.03	[-.11, .16]	.703
Parental perceptions (decreased enjoyment)	-.14	[-.31, .03]	.102	-.11	[-.28, .07]	.235	-.04	[-.17, .09]	.578	.05	[-.09, .20]	.453
Parenting variables												
Ac_par	.45	[.30, .59]	<.001	.03	[-.12, .18]	.683	.02	[-.09, .13]	.690	-.03	[-.13, .07]	.562
Ac_mod	.15	[-.02, .31]	.086	.56	[.42, .70]	<.001	.01	[-.07, .10]	.752	.01	[-.09, .11]	.793
Involvement	.02	[-.09, .13]	.686	-.05	[-.17, .08]	.445	.80	[.72, .88]	<.001	.23	[.10, .35]	.001
Reinforcement	.09	[-.02, .19]	.095	.10	[.01, .19]	.029	.10	[.02, .18]	.020	.57	[.47, .67]	<.001
R <sup>2</sup> = .36				R <sup>2</sup> = .42			R <sup>2</sup> = .73			R <sup>2</sup> = .42		

Note. Adol: Adolescent, SES: socioeconomic status. Ac\_par: Accommodation participation subscale. Ac\_mod: Accommodation modification subscale.

Table S15

The Actor-partner Interdependence Model (APIM) Predicting Adolescents’ Depressive Symptoms and Parental Perceptions for Study 2

Adol depressive mood (T2)							Adol decreased enjoyment (T2)					
Model 1 (without parenting)				Model 2 (with parenting)			Model 1 (without parenting)			Model 2 (with parenting)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	-.09	[-.19, .01]	.073	-.09	[-.19, .01]	.072	.05	[-.04, .13]	.318	.04	[-.05, .13]	.363
SES	-.05	[-.15, .04]	.284	-.05	[-.15, .04]	.281	-.04	[-.12, .05]	.386	-.03	[-.11, .05]	.424
Parental depressive symptoms	-.04	[-.16, .08]	.478	-.03	[-.16, .09]	.610	-.05	[-.16, .07]	.421	-.04	[-.16, .08]	.489
Adol depressive mood	.34	[.18, .51]	<.001	.34	[.17, .51]	<.001	.01	[-.11, .13]	.905	.00	[-.12, .12]	.971
Adol decreased enjoyment	.02	[-.16, .20]	.812	.01	[-.17, .19]	.881	.74	[.59, .89]	<.001	.73	[.58, .89]	<.001
Parental perceptions (depressive mood)	.25	[.06, .45]	.012	.26	[.06, .46]	.012	.15	[-.01, .31]	.064	.15	[-.01, .31]	.071
Parental perceptions (decreased enjoyment)	.05	[-.13, .23]	.596	.06	[-.15, .26]	.586	-.05	[-.23, .13]	.563	-.07	[-.26, .13]	.494
Parenting variables												
Ac_par	—	—	—	-.02	[-.16, .12]	.812	—	—	—	.06	[-.06, .18]	.305
Ac_mod	—	—	—	-.02	[-.14, .10]	.758	—	—	—	-.04	[-.17, .08]	.511
Involvement	—	—	—	.02	[-.14, .18]	.820	—	—	—	-.05	[-.18, .08]	.454
Reinforcement	—	—	—	-.01	[-.13, .10]	.849	—	—	—	-.01	[-.10, .09]	.888
R <sup>2</sup> = .30				R <sup>2</sup> = .30			R <sup>2</sup> = .59			R <sup>2</sup> = .60		

Parental perceptions (depressive mood) (T2)							Parental perceptions (decreased enjoyment) (T2)					
Model 1 (without parenting)				Model 2 (with parenting)			Model 1 (without parenting)			Model 2 (with parenting)		
T1 predictors	β	95%CI	p	β	95%CI	p	β	95%CI	p	β	95%CI	p
Control variables												
Adol gender	.04	[-.05, .14]	.369	.05	[-.05, .15]	.335	.06	[-.04, .15]	.246	.04	[-.06, .13]	.435
SES	.02	[-.09, .12]	.718	.01	[-.09, .11]	.841	-.02	[-.12, .09]	.743	-.01	[-.11, .10]	.908
Parental depressive symptoms	.07	[-.06, .20]	.289	.04	[-.11, .18]	.619	-.01	[-.13, .11]	.892	.03	[-.09, .15]	.654
Adol depressive mood	.21	[.06, .36]	.006	.21	[.06, .36]	.005	.06	[-.07, .18]	.366	.05	[-.08, .18]	.431
Adol decreased enjoyment	-.00	[-.17, .16]	.987	.02	[-.14, .19]	.803	.09	[-.07, .25]	.270	.07	[-.09, .23]	.382
Parental perceptions (depressive mood)	.58	[.39, .78]	<.001	.56	[.36, .77]	<.001	.10	[-.08, .28]	.289	.10	[-.08, .28]	.262
Parental perceptions (decreased enjoyment)	-.09	[-.28, .10]	.334	-.08	[-.30, .13]	.432	.51	[.31, .72]	<.001	.48	[.27, .69]	<.001
Parenting variables												
Ac_par	—	—	—	.02	[-.12, .16]	.813	—	—	—	.08	[-.06, .22]	.253
Ac_mod	—	—	—	.10	[-.04, .25]	.163	—	—	—	-.14	[-.27, -.00]	.048
Involvement	—	—	—	.03	[-.10, .16]	.681	—	—	—	-.11	[-.24, .01]	.066
Reinforcement	—	—	—	.01	[-.09, .11]	.843	—	—	—	-.05	[-.15, .05]	.345
R <sup>2</sup> = .47				R <sup>2</sup> = .49			R <sup>2</sup> = .43			R <sup>2</sup> = .46		



(continued)

	Ac_par (T2)			Ac_mod (T2)			Involvement (T2)			Reinforcement (T2)		
T1 predictors	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>	β	95%CI	<i>p</i>
Control variables												
Adol gender	.03	[-.06, .12]	.534	.02	[-.07, .11]	.651	-.07	[-.15, -.00]	.047	.09	[.01, .18]	.022
SES	-.01	[-.09, .08]	.896	-.03	[-.11, .06]	.563	.01	[-.06, .08]	.754	-.03	[-.11, .06]	.547
Parental depressive symptoms	.07	[-.05, .19]	.236	.14	[.01, .26]	.040	-.01	[-.10, .08]	.813	-.01	[-.11, .10]	.901
Adol depressive mood	-.15	[-.28, -.03]	.018	.06	[-.06, .18]	.312	-.03	[-.15, .08]	.579	-.01	[-.11, .09]	.850
Adol decreased enjoyment	.26	[.08, .44]	.005	.02	[-.15, .19]	.830	.11	[-.02, .24]	.086	.04	[-.11, .18]	.623
Parental perceptions (depressive mood)	.07	[-.10, .23]	.442	.01	[-.16, .18]	.882	-.01	[-.16, .13]	.882	-.10	[-.24, .05]	.186
Parental perceptions (decreased enjoyment)	-.17	[-.36, .03]	.095	-.11	[-.30, .08]	.262	-.03	[-.18, .13]	.713	.09	[-.07, .26]	.273
Parenting variables												
Ac_par	.47	[.33, .61]	<.001	.02	[-.13, .16]	.832	.03	[-.08, .14]	.568	-.01	[-.12, .10]	.877
Ac_mod	.13	[-.03, .30]	.114	.57	[.43, .71]	<.001	.01	[-.08, .10]	.815	.01	[-.09, .11]	.838
Involvement	.02	[-.09, .14]	.709	-.05	[-.18, .08]	.432	.80	[.72, .88]	<.001	.23	[.10, .37]	<.001
Reinforcement	.08	[-.02, .18]	.099	.11	[.01, .20]	.024	.09	[.01, .17]	.025	.55	[.45, .66]	<.001
	<i>R</i> <sup>2</sup> = .38			<i>R</i> <sup>2</sup> = .42			<i>R</i> <sup>2</sup> = .73			<i>R</i> <sup>2</sup> = .42		

*Note.* Adol: Adolescent. Ac\_par: Accommodation participation subscale. Ac\_mod: Accommodation modification subscale. Model fit for Model 1 were  $\chi^2(1011) = 1425.51$ ,  $p < .001$ , CFI = .95, RMSEA = .03, 90%CI [.03, .04], SRMR = .05. For Model 2,  $\chi^2(5727) = 8898.71$ ,  $p < .001$ , CFI = .87, RMSEA = .04, 90%CI [.04, .04], SRMR = .05.

