

# Congruence and Incongruence in Adolescents' and Parents' Perceptions of the Family: Using Response Surface Analysis to Examine Links with Adolescents' Psychological Adjustment

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**Abstract** Parents and adolescents often hold discrepant views about the family environment and these discrepancies may in turn influence adolescents' psychological adjustment. The current study examined how adolescent–parent perceptions of family routines and chaos, and their congruence and incongruence, relate to adolescents' self-reported psychological adjustment (depressive symptoms and perceived stress), both concurrently ( $N_{\text{dyads}} = 261$ ; 53 % female) and 2 years later ( $N_{\text{dyads}} = 118$ ; 50 % female). Using polynomial regression and response surface analysis, results indicated that adolescents' perceptions of the family environment were a stronger predictor of adolescents' adjustment than parents' perceptions (76 % mothers), concurrently and over time. However, both congruence and incongruence in adolescent–parent perceptions were also related to adolescents' adjustment. Specifically, congruently negative adolescent–parent perceptions were associated with worse concurrent adolescent adjustment. Further, incongruence defined by more negativity in adolescents' versus parents' perceptions was associated with worse adolescent psychological adjustment, concurrently and over time. In sum, in addition to the strong links between adolescents' perceptions of the family and their own psychological adjustment, examining how

congruent and incongruent adolescents' perceptions are with parents' perceptions may shed additional light on how the family environment relates to adolescent adjustment.

**Keywords** Adolescent–parent discrepancies · Adolescent psychological adjustment · Family chaos · Family routines · Polynomial regression · Response surface analysis

## Introduction

The family environment plays a critical role in adolescent psychological adjustment (see Repetti et al. 2002). For example, a family environment that is chaotic and inconsistent is likely to be detrimental for adolescents' social and emotional well-being (Evans et al. 2005). Of interest, members of the same family, such as parents and adolescents, often hold discrepant perceptions from one another when rating the same constructs, including adolescent mental health (De Los Reyes et al. 2015) and aspects of the family environment (e.g., Ohannessian et al. 2000). When discrepancies arise, this raises questions regarding which perspective is more predictive of adolescent adjustment and whether the degree and nature of these discrepancies are meaningfully related to adolescent adjustment. The current study examines these questions by utilizing polynomial regression and corresponding response surface analysis to explore how adolescents' and parents' perceptions of family chaos and routines, and congruence and incongruence in these perceptions, relate to adolescent-reported psychological adjustment, both concurrently and 2 years later.

We examined perceptions of family routines and chaos given the critical role these aspects of the family environment play in youth development and functioning. High

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levels of family routines, such as having dinner together as a family and doing homework at the same time each day, are associated with better child adjustment (for review see Fiese et al. 2002). Conversely, more chaotic family environments, characterized by high levels of disorganization, noise, and crowding, are associated with reduced social competence and greater anger and impulsivity (Dumas et al. 2005) and prospectively predict worse youth socioemotional adjustment (Evans et al. 2005) and greater disruptive behaviors, including conduct problems and hyperactivity–inattention (Jaffee et al. 2012). High chaos and low routines may have negative consequences for adolescents both directly, via the stressful nature of more chaotic environments (e.g., high stimulation and uncertainty), and indirectly, via their negative impact on parental stress and disciplinary behaviors (e.g., Dumas et al. 2005).

Family chaos and routines are therefore highly important to adolescents' psychological adjustment. Yet, as noted above, there are often discrepancies in parents' and adolescents' perceptions of the family environment, such as family functioning (Ohannessian et al. 2000), discrepancies that may also emerge in perceptions of chaos and routines. Given this potential for disparate perceptions, it is unclear which perspective would better predict adolescents' adjustment. Prior studies have found that both caregiver-reported (Dumas et al. 2005; Evans et al. 2005) and youth-reported (Jaffee et al. 2012) family chaos predict youth outcomes, making it plausible that both perspectives could, perhaps uniquely, predict adolescents' psychological functioning. Indeed, one reason for discrepant perceptions among individuals rating the same construct may be that each individual has access to different, yet still meaningful, information through exposure to different contexts (Dirks et al. 2012).

Moreover, and central to the current investigation, the degree and nature of discrepancies in adolescent–parent perceptions may also be meaningfully related to adolescents' adjustment. Family-systems theory (Minuchin 2002) outlines the importance of the interactions between family members. Thus, the convergence and divergence in adolescent–parent perceptions may reflect the processes occurring between family members and the quality of those relationships (e.g., Ehrlich et al. 2015), which may in turn play a role in adolescents' adjustment. In particular, discrepancies regarding the family environment may be detrimental because they may both reflect and contribute toward a less certain and supportive family environment for adolescents (e.g., Tein et al. 1994). For example, if adolescents and parents disagree about the degree of family chaos, they may find it difficult to find common ground with one another, contributing to poor communication and greater conflict (Ferdinand et al. 2004). If so, any discrepancy regarding the family environment may be

detrimental for adolescents, regardless of whether the adolescents' perceptions of the family are more or less positive than the parents.

There is support for this perspective in research examining the role of absolute adolescent–parent discrepancies in other domains. For example, greater absolute discrepancies in perceptions of family functioning are associated with lower perceived competence for female adolescents (Carlson et al. 1991; Ohannessian et al. 2000). Further, absolute discrepancies regarding the quality of the parent–adolescent relationship are associated with more adolescent internalizing and externalizing problems (Pelton and Forehand 2001), and discrepancies regarding parenting behavior are also associated with internalizing problems (Gaylord et al. 2003). In addition, greater overall adolescent–parent discrepancies regarding the adolescent's daily experiences are associated with greater adolescent depressive symptoms and worse inflammatory regulation (Human et al. 2014). Thus, across a number of domains, including family, parent, and adolescent factors, and multiple indicators of adolescent functioning, greater overall discrepancies have been linked to worse adolescent adjustment.

It is also possible that the direction of adolescent–parent discrepancies, or whether the adolescents' perceptions are more or less positive than the parents', is important to take into account. For example, if adolescents believe the environment is more chaotic than parents do, they may be particularly unlikely to find the support and validation that they may need from their parents. This lack of support and validation may in turn directly contribute to worse psychological adjustment, as well as make adolescents more vulnerable to the negative aspects of their family environment, whether perceived or real. As such, the direction of adolescent–parent discrepancies, not just the overall amount, may matter in the context of adolescent adjustment.

This argument is supported by research demonstrating that more negativity in adolescents' versus parents' perceptions of parental monitoring is associated with greater adolescent depressive symptoms (De Los Reyes et al. 2008) and rule-breaking behavior (De Los Reyes et al. 2010). Similarly, more negativity in adolescents' versus parents' perceptions of parenting behavior is associated with greater adolescent internalizing problems and less social competence (Guion et al. 2009). In addition, more negativity in adolescents' versus parents' perceptions of adolescents' characteristics, such as internalizing behavior (Ferdinand et al. 2004) and rule-breaking behavior (Laird and De Los Reyes 2013), have also been linked to worse adolescent outcomes. Thus, the direction of adolescent–parent discrepancies, particularly when adolescents' perceptions are more negative than parents' perceptions, also appears to be relevant to adolescent functioning.

Finally, although discrepancies in adolescent–parent perceptions may be detrimental, at times high levels of congruence may also be problematic. For example, some degree of disagreement between parents and adolescents could indicate healthy adolescent individuation from the parent (Carlson et al. 1991). Further, if adolescents and parents agree that the family environment contains high degrees of problematic characteristics, adolescents may be especially at risk, as this may indicate that the family environment is indeed particularly negative. As support, research has found that adolescents’ depressive symptoms are highest when adolescents and parents agree that conflict is high and acceptance is low (Laird and De Los Reyes 2013) and adolescents’ anxiety symptoms are highest when adolescent girls and mothers agree that communication and satisfaction are low (Ohannessian and De Los Reyes 2014). Thus, while high congruence regarding positive family characteristics may be protective or beneficial (Ohannessian et al. 2016), high congruence regarding negative family characteristics may be especially detrimental.

Overall, there is theory and evidence to suggest that adolescent–parent perceptions of the family environment, and their congruence and incongruence, meaningfully relate to adolescents’ adjustment. The current study aims to contribute to this literature by examining the independent and interactive effects of adolescent–parent perceptions of family chaos and routines on adolescent psychological adjustment, including depressive symptoms and perceived stress. We also hope to contribute to the literature by illustrating the benefits of utilizing a rigorous statistical approach that enables the simultaneous and nuanced assessment of both the independent and interactive effects of adolescent–parent perceptions: polynomial regression and response surface analysis (RSA). The vast majority of prior research in this area has assessed discrepancies with difference scores, which have long been criticized on methodological and statistical grounds (Cronbach 1955), including in the literature on parent–adolescent discrepancies (Laird and Weems 2011). One major issue is that difference scores have questionable psychometric properties, including unknown reliability and validity (e.g., Furr 2011). Furthermore, it is difficult to disentangle the association between an outcome variable and a difference score from the associations between the outcome variable and the variables that go into creating the difference score (see Edwards 1994, for a detailed discussion). That is, if a difference score comparing parents’ and adolescents’ perceptions of family chaos predicts greater adolescent depressive symptoms, it is possible that this association could be driven by the direct links between adolescents’ perceptions and adolescent-reported depressive symptoms. Further, should adolescents’ perceptions of both the family and their own psychological adjustment be strongly

associated, it would be unclear whether this is driven by substantive links or simply shared method variance.

Importantly, polynomial regression approaches are able to overcome these issues (Edwards 1994), as has been demonstrated in research on adolescent–parent discrepancies (Laird and De Los Reyes 2013). Polynomial regression is a straightforward approach that enables the simultaneous examination of the independent predictive ability of each perspective as well as whether their congruence and incongruence are also consequential. Thus, unlike difference score approaches, polynomial regression is able to separate out the unique contributions of adolescents’ and parents’ reports on adolescent adjustment, thereby unconfounding the index of discrepancy from the variables that go into assessing the degree of divergence, while also avoiding the potentially problematic psychometric properties of difference scores.

Another major benefit of polynomial regression is that it is able to provide a more nuanced understanding of how different forms of congruence and incongruence relate to the outcome of interest, within a single model. In particular, by using response surface analysis (RSA; e.g., Edwards 2002), one is able to simultaneously assess and visualize different ways that adolescent–parent discrepancies may relate to adolescent outcomes. Specifically, RSA tests four coefficients, two assessing the nature of congruence and two assessing the nature of incongruence. Specifically, the first coefficient,  $a_1$ , examines the “line of congruence”, or whether there is a linear, additive relationship between the two predictors and the outcome variable. That is, as both adolescents’ and parents’ ratings of family chaos increase, do adolescents’ depressive symptoms increase? This would be in line with the hypothesis that high congruence that the family environment is negative is particularly risky for adolescents (e.g., Laird and De Los Reyes 2013). The second coefficient,  $a_2$ , tests whether there is significant curvilinearity in the  $a_1$  coefficient, or in the relationship between the line of congruence and the outcome of interest. For example, it is possible that adolescents’ depressive symptoms are elevated when there is high congruence regarding high *and* low levels of chaos, if this indicates low levels of healthy adolescent individuation (Carlson et al. 1991). Thus, the  $a_1$  and  $a_2$  coefficients allow us to test for nuanced relationships between adolescent–parent congruence and adolescent adjustment.

The third and fourth coefficients test the “line of incongruence”, examining whether disagreement between perspectives is consequential. Specifically,  $a_3$  tests whether one direction of incongruence is more important than the other—for example, is more negativity in adolescents’ perceptions than parents’ perceptions associated with worse adolescent psychological adjustment? The  $a_4$  coefficient tests whether the overall amount incongruence or

disagreement, regardless of direction, is relevant to the outcome—thus, is any disagreement regarding family chaos, regardless of whether the adolescent is more or less positive than the parent, associated with worse adolescent adjustment? These latter coefficients are conceptually analogous to examining directional and absolute difference scores, respectively, but without the same statistical and interpretational drawbacks.

## Hypotheses

Given the strengths of polynomial regression and RSA, combined with their increasing accessibility (see Shanock et al. 2010 for illustrative examples and SPSS syntax; see Schönbrodt 2015 for *R* package), we utilized these approaches to examine how adolescent–parent perceptions of the family environment relate to adolescents’ psychological adjustment. Specifically, we examined how adolescents’ and parents’ perceptions of family routines and chaos relate to adolescents’ depressive symptoms and perceived stress, both concurrently and, for a subsample of participants, 2-years later. We hypothesized that, in addition to any direct links between adolescents’ perceptions of family chaos and routines and adolescents’ adjustment, the degree of congruence and incongruence would also be consequential. Specifically, in line with other research utilizing polynomial regression approaches (e.g., Laird and De Los Reyes 2013), we hypothesized that worse adolescent psychological adjustment would be predicted by (1) greater adolescent–parent congruence that the environment contains high chaos and low routines, and (2) greater incongruence marked by adolescents holding more negative perceptions of the family environment than parents.

## Methods

### Participants

A total of 261 adolescent–parent dyads participated in this part of a larger study examining family life experiences and health. Families were recruited through public schools, newspaper ads, and community postings. We focus here on a subset of measures most relevant to current objectives.<sup>1</sup> Both adolescents ( $M_{age} = 14.53$ ;  $SD = 1.07$ ; Age range 13–16; 139 female, 122 male; 129 European descent, 74 Asian descent, 58 other) and parents ( $M_{age} = 45.83$ ;  $SD = 5.50$ ; Age range 32–64; 157 European descent, 67 Asian descent, 37 other) were fluent in English and in good

health. The participating parents were predominately mothers (199; 76 %), lived with the adolescent, and were a biological parent (except for one, who adopted their child at birth).

### Procedure

All data were collected during in-person lab visits with both the adolescent and participating parent, during two waves of data collection. Wave one data were collected between January 2010 and March 2012. Upon arrival at the lab, a research assistant verbally explained the study procedures, and parents provided informed consent and adolescents provided assent. Both parents and adolescents completed family environment measures and adolescents completed psychological adjustment measures. Approximately 2 years later (Time 2), a subsample of adolescents ( $n = 118$ ) were invited back (those who completed wave one prior to March 2011) and completed the same psychological adjustment measures; this subsample of adolescents did not differ significantly from those who did not participate in the follow-up on any of the above demographic variables, or on psychological adjustment, all  $ps > .15$ . Due to missing data on individual scales, sample sizes for individual analyses range from 239 to 252 at Time 1 and 115 to 117 at Time 2; all available data were used for each analysis. Participants were compensated \$75 for completion of the first lab visit and \$100 for the completion of second lab visit. This study was approved by the behavioral research ethics board at the University of British Columbia.

### Measures

#### *Family Environment*

Both parents and adolescents completed questionnaires about family routines and chaos. Descriptive statistics for both parents’ and adolescents’ ratings on each variable are presented in Table 1. The degree of family routines was assessed with the 20-item Family Routines Inventory (FRI; Jensen et al. 1983). A series of statements were presented to both parents and adolescents (e.g., “Children do their homework at the same time each day or night during the week”, and “Parents and children spend time together sometime each day”) and participants were asked whether this was a routine in their family on a 0 (*almost never*) to 3 (*always*) scale ( $\alpha$ s: Parents = .85; Adolescents = .79). Higher scores reflect a greater a degree of consistency in family routines.

The degree of chaos versus calm in the household environment was assessed with the Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al. 1995). The scale

<sup>1</sup> See Manczak et al. (2015) and Human et al. (2014) for details on additional components of the study.

**Table 1** Descriptive statistics for family environment variables and correlations with adolescent psychological adjustment

Family characteristic	Descriptives		Depressive symptoms		Perceived stress	
	Mean	SD	T1	T2	T1	T2
Adolescent-rated						
Family routines	1.73	.43	-.24***	-.26**	-.26***	-.29**
Chaos	.24	.20	.25***	.23*	.33***	.22*
Parent-rated						
Family routines	1.94	.45	-.12 <sup>†</sup>	.01	-.03	.02
Chaos	.19	.18	.08	-.02	.01	-.07

Family routines were measured on a 0 (almost never) to 3 (always) scale and chaos was measured on 0 (no) or 1 scale. T1 = time 1 (concurrent with family environment perceptions); T2 = time 2 (2 years after family environment perceptions)

<sup>†</sup>  $p \leq .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

includes 15 items assessed on a true or false scale (e.g., “You can’t hear yourself think in our home”, “We almost always seem to be rushed”), with higher scores reflecting greater chaos ( $\alpha$ s: Parents = .75; Adolescents = .76). Ratings of family routines and chaos were significantly negatively correlated, for both parents’ and adolescents’ ratings, both  $r$ s =  $-.42$ ,  $p < .001$ .

### Adolescent Adjustment

Adolescents completed the 10-item version of the Center for Epidemiological Studies Depression (CES-D) Scale (Radloff 1977) on a 0 (*rarely or none of the time*) to 3 (*most or all of the time*) scale and sum scores were calculated for both Time 1 ( $M = 7.80$ ;  $SD 4.43$ ;  $\alpha = .72$ ) and Time 2 ( $M = 8.53$ ;  $SD 4.91$ ;  $\alpha = .76$ ). Higher scores therefore indicate greater levels of adolescent depressive symptoms. Adolescents also completed the 4-item version of the Perceived Stress Scale (PSS; Cohen et al. 1983) on a 0 (*never*) to 4 (*very often*) scale and sum scores were calculated for both Time 1 ( $M = 5.16$ ;  $SD 2.64$ ;  $\alpha = .65$ ) and Time 2 ( $M = 5.99$ ;  $SD 2.84$ ;  $\alpha = .68$ ). Higher scores therefore indicate greater levels of adolescent perceived stress. Adolescents’ ratings of depressive symptoms and perceived stress were significantly correlated, at both Time 1,  $r = .53$ ,  $p < .001$ , and Time 2,  $r = .72$ ,  $p < .001$ .

### Analytical Approach

We utilized polynomial regression and RSA to assess the independent and interactive associations between adolescents’ and parents’ perceptions of the family environment and adolescents’ psychological adjustment. Specifically, for each family domain, we regressed adolescents’ adjustment (either depressive symptoms or perceived stress) on adolescents’ ratings of the family environment, parents’ ratings of the family environment, the interaction between adolescents’ and parents’ ratings, and adolescents’

and parents’ ratings squared. These models were run with the RSA package in R (Schönbrodt 2015), which provides the polynomial and RSA coefficients, as well as graphical displays of each analysis.

The polynomial coefficients provide information regarding the independent linear and quadratic relationships between each perspective and adolescents’ adjustment. However, to examine the role of parent–adolescent congruence and incongruence, the polynomial regression coefficients are not directly examined (e.g., Shanock et al. 2010). Instead, we examined the RSA coefficients, which are derived from the polynomial coefficients.<sup>2</sup> As described above, we examined each of the four RSA coefficients to assess (1)  $a_1$ : if adolescents’ psychological adjustment was worse when adolescents’ and parents’ perceptions of the family were congruently negative, (2)  $a_2$ : if there was curvilinearity in the  $a_1$  coefficient, such that high congruence in either direction was associated with worse psychological adjustment, (3),  $a_3$ : if the direction of incongruence in adolescent–parent perceptions, such as when adolescents’ perceptions were more negative than parents’ perceptions, predicted worse adolescent psychological adjustment, and (4)  $a_4$ : if any incongruence, regardless of direction, predicted worse adolescent adjustment.

<sup>2</sup> The RSA coefficients are derived directly from the polynomial coefficients as follows:  $a_1 = (b_{\text{Parent}} + b_{\text{Adol}})$ , where  $b_{\text{Parent}}$  is the beta coefficient for parents’ ratings and  $b_{\text{Adol}}$  is the beta coefficient for adolescents’ ratings.  $a_2 = (b_{\text{Parent}}^2 + b_{\text{Adol}*\text{Parent}} + b_{\text{Adol}}^2)$ , where  $b_{\text{Parent}}^2$  is the beta coefficient for parents’ ratings squared,  $b_{\text{Adol}*\text{Parent}}$  is the beta coefficient for the cross-product of parents’ and adolescents’ ratings, and  $b_{\text{Adol}}^2$  is the beta coefficient for adolescents’ ratings squared.  $a_3 = (b_{\text{Parent}} - b_{\text{Adol}})$ .  $a_4 = (b_{\text{Parent}}^2 - b_{\text{Adol}*\text{Parent}} + b_{\text{Adol}}^2)$ . The RSA package in R (Schönbrodt 2015) calculates and provides significance tests for each RSA coefficient. However, the package does not currently enable the inclusion of covariates. Thus, for all analyses involving covariates (see “Sensitivity Analyses” section), the RSA coefficients were derived from the polynomial coefficients using the formulas above and significance tests were calculated by hand using formulas provided by Shanock et al. (2010, Appendix 2).

The corresponding graphical displays for each analysis help to illustrate the nature of the effects by presenting the lines congruence and incongruence in three-dimensional space. Specifically, each corner of a figure reflects a different combination of parent and adolescent congruence versus incongruence. The line from the front to back of the figure reflects the line of congruence, with the front corner indicating that both adolescents' and parents' ratings were low on a given domain (e.g., low chaos reported by both), and the back corner indicating that both adolescents' and parents' were high (e.g., high chaos reported by both). The line from the left to right reflects the line of incongruence, with the left corner indicating that adolescents' ratings were low and parents' ratings were high, and the right corner indicating that adolescents' ratings were high and parents' ratings were low. Using the RSA coefficients and corresponding figures, we therefore examined how each aspect of congruence and incongruence relates to adolescents' depressive symptoms and perceived stress, both concurrently and 2 years later.

## Results

Table 1 presents the means and standard deviations for parent- and adolescent-reported family routines and chaos and their bivariate correlations with adolescents' psychological adjustment. As can be seen in the means, adolescents tended to hold more negative views of the family than parents, all  $ps < .01$ . Further, adolescents' perceptions of family routines and chaos were strongly associated with adolescents' adjustment both concurrently (T1) and 2 years later (T2). Parents' perceptions of the family environment were not strongly associated with adolescents' adjustment. The independent and nonlinear associations between each perspective and adolescents' adjustment will be examined further below with the polynomial regression analyses (See Table 2). Consistent with prior research, adolescent–parent perceptions were moderately correlated for both family routines,  $r = .36, p < .001$ , and chaos,  $r = .32, p < .001$ . These correlations indicate that there was a good degree of congruence in adolescent–parent perceptions, but that incongruence also exists.

### Polynomial Regression

Consistent with the bivariate correlations, adolescents' perceptions of the family environment tended to strongly and significantly predict adolescent-reported psychological adjustment both concurrently and over time, in a linear fashion (see Table 2,  $B_{\text{Adol}}$  coefficients). Specifically, adolescents who reported low family routines and greater chaos reported greater depressive symptoms and

perceived stress, both initially and 2 years later. In contrast, parents' perceptions were not as strongly associated with adolescents' depressive symptoms or perceived stress, with the exception of the occasional marginal linear and nonlinear association (see Table 2,  $B_{\text{Parent}}$  and  $B_{\text{Parent}}^2$  coefficients).

We next examined the RSA coefficients to explore whether congruence and incongruence in adolescents' and parents' perceptions relate to adolescents' adjustment, over and above the direct associations with adolescents' perceptions. The coefficients from each polynomial regression and RSA are provided in Table 2. Further, the RSA plots are provided in Figs. 1 and 2, providing a visual illustration of the results for each domain and both psychological adjustment indicators, at each time point.

### RSA Effects with Concurrent Adolescent Psychological Adjustment

Starting by examining the concurrent associations between perceptions of the family environment and adolescents' psychological adjustment, we observed consistent significant line of congruence effects (i.e., significant  $a_1$  coefficients). Specifically, for family routines, the coefficients were negative, indicating that when both adolescents' and parents' perceptions of routines were low (front corners of Fig. 1, Panels A and C), adolescents' depressive symptoms and perceived stress tended to be higher. Conversely, the  $a_1$  coefficients were positive for chaos, indicating that when both adolescents and parents reported greater chaos (back corners of Fig. 1, Panels B and D), adolescents' depressive symptoms and perceived stress were greater. In contrast, adolescents reported lower levels of depressive symptoms and perceived stress when both adolescents and parents reported low levels of chaos (front corners of Fig. 1, Panels B and D).

There were also indications that the line of incongruence, and in particular, the direction of such incongruence, was relevant to concurrent adolescent adjustment, marginally for adolescents' depressive symptoms and significantly for perceived stress (i.e., significant  $a_3$  coefficients). For example, there was a significant positive directional line of incongruence effect for perceptions of family routine predicting perceived stress, such that adolescents' perceived stress was higher when adolescents perceived low levels of family routine and parents perceived high levels of routine (right corner of Fig. 1, Panel C). Similarly, adolescents who reported high levels of chaos when their parents reported low levels of chaos tended to report higher levels of perceived stress (left corner of Fig. 1, Panel D). Parallel but marginal directional incongruence effects were observed for perceptions of routines and chaos predicting concurrent adolescent depressive symptoms.

**Table 2** Adolescent–parent congruence and incongruence as predictors of adolescents' depressive symptoms and perceived stress

Domain	Regression slopes						RSA coefficients			
	$b_0$ (SE)	$b_{\text{Parent}}$ (SE)	$b_{\text{Adol}}$ (SE)	$b_{\text{Parent}}^2$ (SE)	$b_{\text{Adol} \times \text{Parent}}$ (SE)	$b_{\text{Adol}}^2$ (SE)	$a_1$ (SE)	$a_2$ (SE)	$a_3$ (SE)	$a_4$ (SE)
<i>Time 1</i>										
Depressive symptoms										
Routine	7.78*** (0.40)	−0.53 (0.69)	−2.35*** (0.68)	0.58 (1.39)	−2.09 (1.89)	0.45 (1.49)	−2.88*** (0.80)	−1.06 (1.56)	1.82 <sup>†</sup> (1.11)	3.12 (3.56)
Chaos	7.91*** (0.42)	−0.45 (2.36)	6.10*** (1.92)	0.83 (8.80)	2.72 (8.57)	−2.67 (5.97)	5.65* (2.56)	0.88 (9.71)	−6.56 <sup>†</sup> (3.46)	−4.55 (16.55)
Perceived stress										
Routine	5.17*** (0.22)	0.36 (0.44)	−1.77*** (0.38)	0.74 (0.72)	−1.22 (1.04)	−0.37 (0.81)	−1.44** (0.49)	−0.85 (0.71)	2.12** (0.66)	1.58 (1.92)
Chaos	5.10*** (0.24)	−2.22 <sup>†</sup> (1.23)	4.97*** (1.04)	2.88 (4.32)	1.58 (3.84)	−1.02 (3.10)	2.76* (1.40)	3.45 (5.03)	−7.19*** (1.80)	0.29 (7.34)
<i>Time 2</i>										
Depressive symptoms										
Routine	8.18*** (0.70)	1.91 <sup>†</sup> (1.12)	−2.37* (1.04)	0.27 (3.47)	−3.73 (3.50)	2.45 (2.33)	−0.46 (1.22)	−1.00 (2.24)	4.28* (1.78)	6.45 (6.83)
Chaos	7.21*** (0.64)	−7.13 <sup>†</sup> (3.78)	4.34 (2.66)	25.65 <sup>†</sup> (13.53)	−11.53 (13.39)	14.57 (12.07)	−2.78 (4.21)	28.69 <sup>†</sup> (17.10)	−11.47* (5.00)	51.75 <sup>†</sup> (27.13)
Perceived stress										
Routine	5.74*** (0.37)	0.92 (0.66)	−1.75*** (0.53)	0.94 (1.34)	−0.96 (1.34)	0.70 (1.01)	−0.82 (0.78)	0.68 (1.19)	2.67** (0.91)	2.60 (3.06)
Chaos	5.65*** (0.39)	−3.38 (2.16)	3.55* (1.57)	8.03 (7.40)	−9.21 (6.63)	3.79 (6.24)	0.66 (2.55)	2.60 (9.62)	−6.93* (2.77)	21.03 (13.58)

SE, standard error; Adol, adolescent;  $a_1$ , line of congruence;  $a_2$ , curvilinearity in line of congruence;  $a_3$ , line of incongruence;  $a_4$ , curvilinearity in line of incongruence

<sup>†</sup>  $p \leq .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

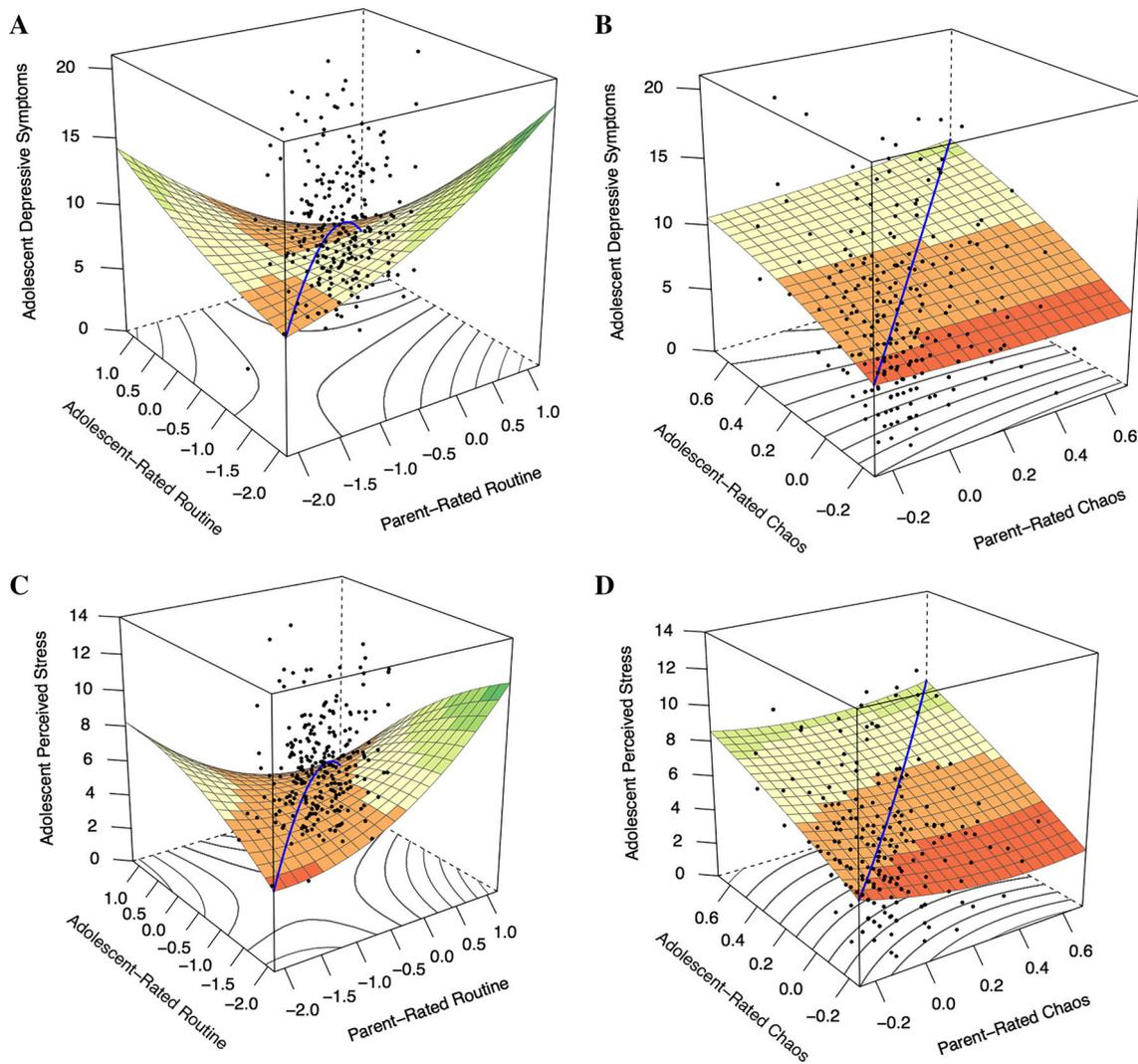
### RSA Effects with Adolescent Psychological Adjustment 2-Years Later

The strong congruence effects observed with concurrent adolescent psychological adjustment did not emerge when predicting adolescents' depressive symptoms and perceived stress 2-years later (i.e., non-significant  $a_1$  coefficients). There was a marginal non-linear line of congruence association between perceptions of chaos and adolescents' depressive symptoms at Time 2. Examining Fig. 2, Panel B, suggests a pattern similar to the concurrent directional congruence effects, such that adolescents' depressive symptoms were highest when adolescents and parents agreed that family chaos was high.

In contrast, the directional incongruence effects ( $a_3$  coefficients) were even more consistent when predicting depressive symptoms and perceived stress 2 years later. These effects are clearly illustrated in Fig. 2. Specifically, in Panels A and C, adolescents' depressive symptoms and

perceived stress were clearly at their highest when adolescents' perceptions of routine were low and parents' perceptions were high (right corner). Conversely, the spikes in depressive symptoms and perceived stress in the left hand corners of Panels B and D of Fig. 2 demonstrate that when adolescents' perceptions of family chaos were high and parents' perceptions were low, adolescents' depressive symptoms and perceived stress tended to be at their highest. Thus, when adolescents' perceptions were more negative than parents' perceptions, adolescents' reported worse psychological adjustment 2-years later.

There was also an indication, albeit marginal, of an overall incongruence effect regarding family chaos predicting subsequent adolescent depressive symptoms ( $a_4$  coefficient). As can be seen in Fig. 2, Panel B, although adolescents' depressive symptoms were at their peak when adolescents perceived high chaos and parents perceived low chaos (left corner), adolescents' depressive symptoms were also high when adolescents perceived low chaos and



**Fig. 1** Response Surface Analysis plots for concurrent adolescent depressive symptoms (**a, b**) and perceived stress (**c, d**)

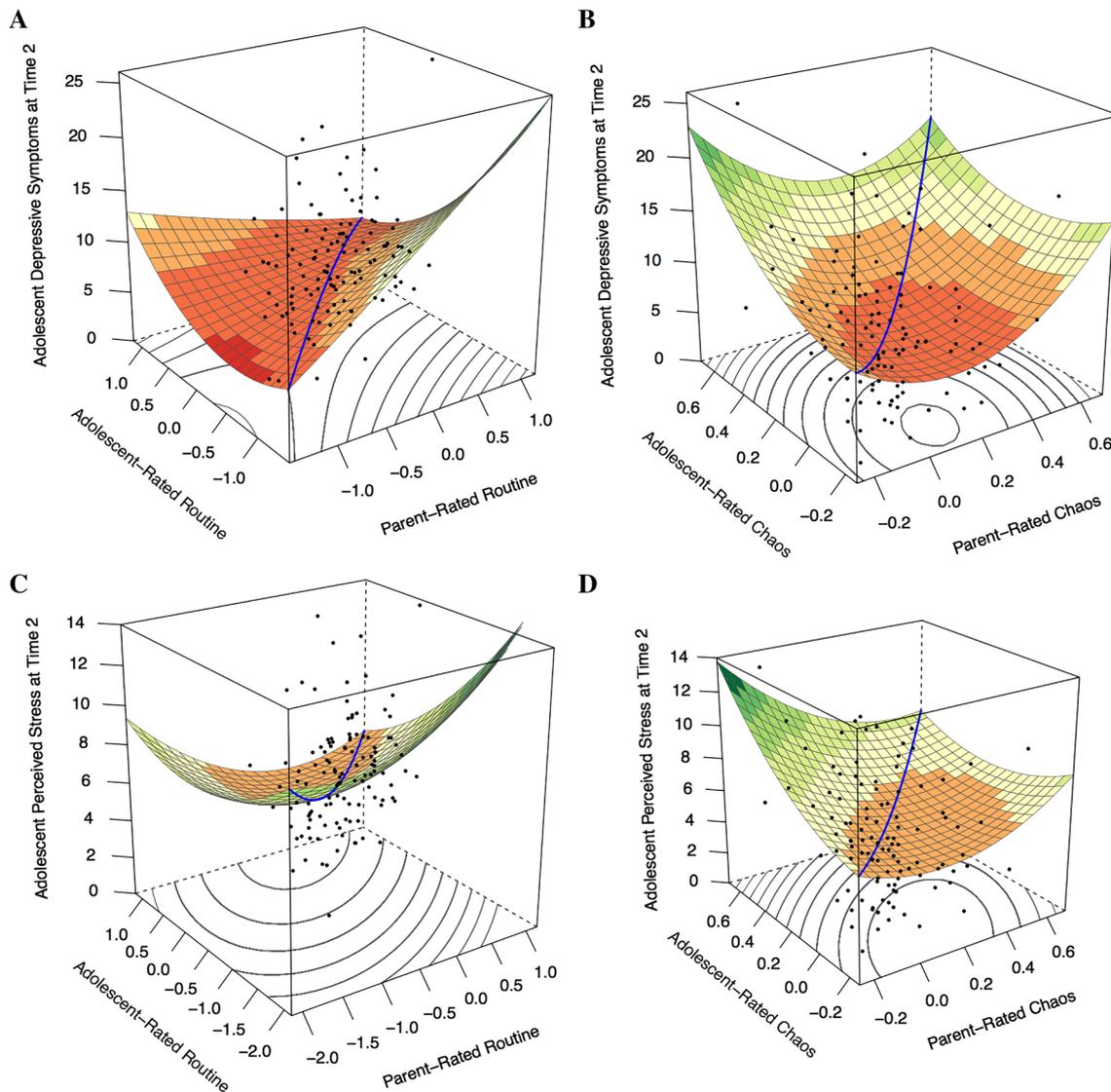
parents perceived high chaos (right corner). Nevertheless, as this effect was marginal and only emerged in one analysis, we interpret it with caution.

**Sensitivity Analyses**

We also examined whether adolescent–parent incongruence remained a significant predictor of adolescents’ psychological adjustment at Time 2 when controlling for Time 1 adjustment. Of note, the associations between the key  $a_3$  coefficients and Time 2 depressive symptoms and perceived stress were weaker but highly consistent upon controlling for Time 1 depressive symptoms and perceived stress,  $a_3$  coefficient range |1.49–10.03|,  $p$  value range .04–.13. As we would expect some attenuation in these effects given the strong associations between Time 1 and Time 2 adjustment,  $r_s = .36–.37$ , all  $p_s < .001$ , and the smaller

sample size at Time 2, these results provide preliminary evidence that parent–adolescent discrepancies may indeed influence subsequent adolescent psychological adjustment.

In addition, we examined whether results differed as a function of adolescents’ ethnicity, parents’ and adolescents’ gender, and the gender match within parent–adolescent dyads. Adolescents’ ethnicity did not significantly influence the polynomial regression coefficients, all  $p_s > .08$ , suggesting that the results did not strongly differ for adolescents of different ethnic backgrounds (e.g., Asian vs. Caucasian). There were, however, some interactions between gender and the polynomial coefficients. Specifically, parents’ ratings of family routine were more strongly associated with male adolescents’ perceived stress than female adolescents’ perceived stress, and female adolescents’ own ratings of chaos were less strongly associated with their depressive symptom ratings at Time 2 than male



**Fig. 2** Response surface analysis plots for adolescent depressive symptoms (a, b) and perceived stress (c, d) at Time 2

adolescents' ratings, all  $ps < .05$ . Further, mothers' ratings of family chaos were marginally more strongly associated with adolescents' depressive symptoms and perceived stress at Time 2, compared with fathers' ratings, all  $ps < .08$ . Nevertheless, the RSA coefficients of interest in these analyses all remained significant upon controlling for adolescents' and parents' gender, all  $ps < .05$ . Finally, parent–adolescent gender match did not significantly influence the polynomial regression coefficients, all  $ps > .06$ . Overall, then, even though adolescents' and parents' gender may play a role in some of the associations between parent–adolescent perceptions of the family environment and adolescent adjustment, the associations between parent–adolescent congruence and incongruence were robust upon controlling for these sample characteristics.

## Discussion

The family environment plays a critical role in adolescent functioning. For example, chaotic family environments predict poor adolescent mental and physical health (Evans et al. 2005), whereas family routines are associated with better adolescent mental health (Fiese et al. 2002). Yet parents and adolescents do not always agree about their family environment—that is, adolescents' and parents' perceptions often contain discrepancies (e.g., De Los Reyes et al. 2015). Given the importance of the broader family system in adolescent functioning (Minuchin 2002), it is plausible that these discrepancies in adolescent–parent perceptions are themselves meaningful predictors of adolescent outcomes, above and beyond any direct effects of individual perceptions of family environment. That is, how

adolescents' perceptions align, or do not align, with parents' perceptions, may shed additional light on how the family environment comes to influence adolescents' psychological adjustment.

Although a substantial body of literature has examined this question, much prior research has often relied on difference scores, which can be difficult to interpret due to statistical issues (see Laird and Weems 2011). As such, we sought to illustrate the utility of using a statistically rigorous approach to assessing adolescent–parent discrepancies: polynomial regression and corresponding response surface analyses (RSA; Edwards 1994). Specifically, this approach allowed us to simultaneously address three important and nuanced questions: (1) to what extent do parent–adolescent perceptions of family chaos and routines each independently predict adolescent-reported psychological adjustment, (2) does the degree and nature of congruence between adolescent–parent perceptions predict adolescents' adjustment, and (3) does the direction and nature of incongruence predict adolescents' adjustment? Below, we discuss how our findings contribute to answering each of these questions.

### Whose Perceptions Independently Predict Adolescents' Psychological Adjustment?

Before considering the roles of both congruence and incongruence, it is first important to examine the direct and independent links between adolescents' and parents' perceptions of the family environment and adolescents' adjustment. In the current study, we observed strong associations between adolescents' perceptions of the family chaos and routines and adolescents' reports of psychological adjustment, both concurrently and over time. Specifically, adolescents who reported less routines and more chaos tended to report greater depressive symptoms and perceived stress. This is consistent with prior theory and research that indicates that the presence of family routines is beneficial to adolescent mental health (Fiese et al. 2002), whereas more chaotic family environments hinder adolescent socioemotional functioning (Evans et al. 2005).

In contrast, the independent, direct associations between parents' perceptions of the family environment and adolescents' reports of psychological adjustment were much weaker, if present at all. Thus, parents' perceptions of family chaos and routines did not have much predictive power in the context of adolescent functioning. It is unclear whether adolescents' perceptions of the family environment are truly more strongly related to adolescent-reported psychological adjustment, or whether these associations are simply due to shared method variance. This is an important question for future research, requiring alternate methods,

such as the use of non-adolescent reported outcome measures. Regardless of the source, however, these strong direct associations between adolescents', but not parents', ratings of the family and adolescent-reported adjustment make it especially important to avoid the use of difference scores to assess adolescent–parent discrepancies. Indeed, one of the main criticisms of difference scores is that they confound each variable that goes into the difference score with the difference score itself in prediction of an outcome (e.g., Laird and Weems 2011)—an issue that is particularly problematic when one of those variables is more strongly related to the outcome of interest than the other, and when that relationship is possibly just a methodological artifact. Thus, we utilized polynomial regression and RSA to overcome these issues and provide a clearer picture of how congruence and incongruence among perspectives may relate to adolescents' psychological adjustment.

### Does Adolescent–Parent Congruence Predict Adolescents' Psychological Adjustment?

In line with previous research, adolescent–parent perceptions of the family environment, in this case of the degree of chaos and routines, were moderately correlated, suggesting that for many adolescent–parent dyads, there was a good degree of congruence in their perceptions of the family environment. That is, adolescents who reported low levels of routines and high chaos are likely to have parents who also reported low levels of routines and high chaos. In turn, we found evidence that such congruence between adolescents' and parents' perceptions was relevant to adolescents' psychological adjustment, at least concurrently. Specifically, when both adolescents and parents reported high levels of chaos and low levels of routines, adolescents reported greater levels of depressive symptoms and perceived stress, compared with adolescents and parents who both reported low chaos and high routine. These findings, consistent with previous research (Laird and De Los Reyes 2013; Ohannessian and De Los Reyes 2014), are not altogether surprising and may occur because high congruence provides a more accurate picture of what the family environment is like (e.g., that the family truly is high vs. low in chaos). Thus, high adolescent–parent congruence may indeed at times predict worse adolescent functioning. However, in contrast to previous theorizing suggesting that any congruence may be detrimental because it may suggest a lack of individuation between the adolescent and parent (e.g., Carlson et al. 1991), these findings suggest that congruence is likely to be problematic if it indicates that the family environment does indeed involve particularly negative components (see Ohannessian et al. 2016).

Of note, however, these initial associations between congruently negative perceptions of the family

environment and worse adolescent adjustment did not persist as strongly over time. On the one hand, this may simply be because the longitudinal sample was smaller and thus our power to detect such effects was weaker. Nevertheless, we found other, quite strong, longitudinal associations, suggesting that the lack of effects could indeed be meaningful. In particular, it is possible that congruence about negative family environment characteristics, although a risk factor initially, may be less problematic over time. Specifically, if the parent is aware of negative family environment characteristics, the parent may be able to take action to change the situation or at least provide support to or validate the adolescent's perceptions. This is in line with theorizing in the romantic relationships literature, which argues that negative relationship processes may have short-term costs but ultimately have long-term benefits by triggering positive change (e.g., McNulty and Russell 2010).

### **Does Adolescent–Parent Incongruence Predict Adolescents' Psychological Adjustment?**

Although adolescent–parent perceptions did exhibit a moderate degree of congruence, there was also room for incongruence. That is, some adolescents who viewed the family environment highly negatively had parents who reported a much more positive family environment, and vice versa. Previous research and theorizing suggests that both the overall amount of incongruence and the direction of incongruence could be important to adolescents' functioning. However, in the current study, we primarily found support for the latter argument. Specifically, we found evidence that the direction of incongruence in each domain was important to adolescent psychological adjustment, concurrently and even more consistently 2-years later. In particular, incongruence defined by adolescents holding more negative perceptions of the family environment than parents was associated with higher levels of adolescent depressive symptoms and perceived stress. Similar results have also been obtained using directional difference scores (De Los Reyes et al. 2008, 2010; Guion et al. 2009; Ferdinand et al. 2004). The current study, as well as work using polynomial regression (Laird and De Los Reyes 2013), suggests that these associations may not entirely be a function of methodological artifacts. That is, more negativity in adolescents' versus parents' perceptions of the family may be a particular risky pattern of incongruence.

It will be critical for future research to explore and understand why this pattern of incongruence is linked to worse adolescent adjustment. It is of course possible that adolescents' depressive symptoms and perceived stress contribute to this pattern of incongruence, in line with the supposition that greater depressive symptoms are

associated with a tendency to provide more negative ratings of experiences (i.e., a depression distortion; De Los Reyes et al. 2008; De Los Reyes and Prinstein 2004). However, incongruence was an even more consistent predictor of adolescents' adjustment prospectively and these effects largely held controlling for initial levels of adjustment, suggesting that the incongruence itself may indeed contribute to worse adolescent adjustment. One reason such incongruence may be detrimental is that it may reflect a lack of awareness or insight on the part of the parent, whether of real family problems or of their adolescents' perceptions of them. Such lack of awareness on the part of a parent could in turn be detrimental for the adolescent, making it less likely that the adolescent will find the support they need to deal with the negative (or perceived negative) aspects of the family environment. Thus, unlike congruently negative perceptions, which may enable positive changes in the long term, incongruently negative perceptions may be more difficult to overcome. This may help to explain why more negativity in adolescents' compared with parents' perceptions was an even more consistent predictor of worse adolescent adjustment over time.

In contrast, we found much less support for arguments that any incongruence, regardless of direction, is harmful to adolescents. Indeed, we only observed one, marginally significant, association in support of this perspective. Specifically, overall incongruence in adolescent–parent perceptions of chaos was marginally associated with greater adolescent depressive symptoms 2 years later. To the extent that this effect is reliable, it does lend some support to theorizing that overall incongruence in adolescent–parent perceptions may create conflict and uncertainty that is detrimental to the adolescent, regardless of the nature of that disagreement (e.g., Tein et al. 1994). Further, it supports other empirical findings that the overall amount of discrepancy or disagreement is linked to worse adolescent adjustment (Carlson et al. 1991; Gaylord et al. 2003; Human et al. 2014; Ohannessian et al. 2000; Pelton and Forehand 2001). Nevertheless, this was the most inconsistent finding in the current study and therefore additional research, which preferably does not rely upon difference scores, is needed to replicate and extend such findings.

Overall, then, the current study suggests that (1) adolescents' perceptions of family chaos and routines are a stronger predictor of adolescent-reported adjustment than parents' perceptions, and that (2) congruently negative perceptions predict worse adolescent adjustment, at least concurrently, and (3) incongruence characterized by more negativity in adolescents' versus parents' perceptions predicts worse adolescent adjustment, both concurrently and over time. Though these findings corroborate previous work using difference score approaches, particularly directional difference scores, we encourage future

researchers to continue to utilize and develop methods that avoid the interpretational pitfalls of difference scores. This will allow us to further enhance our confidence in whether adolescent–parent discrepancies are indeed meaningful. Further, RSA provides more nuanced insights into how discrepancies relate to important outcomes by allowing the simultaneous assessment of multiple forms of congruence and incongruence within a single analysis. Of note, polynomial regression and RSA approaches are becoming increasingly accessible, given the recent development of a highly user-friendly package in *R* (Schönbrodt 2015) and the availability of step-by-step guides for SPSS and excel (Shanock et al. 2010), making this a very feasible goal for future research.

### Limitations and Future Directions

A highly important future research direction will be to more directly examine the causal associations between adolescent–parent discrepancies and adolescents’ psychological adjustment. Indeed, although we conceptualize discrepancies as predictors of adolescent adjustment, as mentioned above, it is also plausible that adolescents’ depressive symptoms and perceived stress may influence adolescents’ perceptions of the family environment, in line with the depression–distortion hypothesis (De Los Reyes et al. 2008) or a dysphoria-related bias (Youngstrom et al. 1999). In the current study, we obtained preliminary evidence that discrepancies may play a prospective role in adolescents’ adjustment by finding that incongruence predicted psychological adjustment 2 years later, even after controlling for concurrent adjustment (although the effects were slightly attenuated). Although our follow-up sample was relatively small, these findings are consistent with other studies that have found that discrepancies predict adolescent outcomes over time (De Los Reyes et al. 2010; Ferdinand et al. 2004; Guion et al. 2009). However, it remains possible, and indeed highly likely, that these associations are bi-directional. Hopefully future work will be able to more directly examine these different causal patterns, ideally by assessing perceptions of the family and adolescent psychological adjustment at more than two time points and with larger samples. Further, an important goal for future research will be to examine underlying mechanistic processes, such as communication, responsiveness, and supportive behaviors, which may link adolescent–parent discrepancies to adolescents’ adjustment.

It is also important to note that a sizeable proportion of our sample included participants of Asian descent and that our sample predominately consisted of mothers. Although we did not find that ethnicity strongly influenced our results, it is possible that we did not have sufficient power to detect these effects, particularly in our longitudinal

analyses. Indeed, other studies have shown that the magnitude of parent–child agreement in reports of internalizing and externalizing symptoms varies as a function of ethnicity (e.g., Dirks et al. 2014; Lau et al. 2004), differences that may reflect meaningful cultural variability in parent–child relationships (see Bush and Peterson 2013). Previous research has also found that the links between adolescent–parent discrepancies and adolescent functioning can differ as a function of adolescents’ and parents’ gender (e.g., Carlson et al. 1991; Ohannessian et al. 2000), suggesting that our results may have differed if we had obtained a larger sample of fathers. Overall, it will be important for future research to continue to consider the roles of both ethnicity and gender in the links between adolescent–parent discrepancies and adolescent functioning.

Finally, we only examined two, highly interrelated, aspects of the family environment, family routines and chaos, and of adolescent adjustment, thereby making it unclear whether these effects generalize beyond the domains examined here. That is, perhaps if we had examined other domains of family environment or indicators of adolescent adjustment, we may have found different patterns of congruence and incongruence were more or less important. For example, the current study primarily focused on aspects of adolescents’ internalizing behaviors, but different patterns may emerge with externalizing behaviors.

### Conclusion

Adolescent–parent dyads vary in the extent to which their perceptions of the family environment align with one another. In turn, the degree of congruence and incongruence in adolescent–parent perceptions predicts adolescents’ psychological adjustment. In particular, adolescents who agree with their parents that the family environment involves negative elements, such as high levels of chaos and low levels of family routines, are likely to report worse psychological adjustment than adolescents who agree with their parents that the family environment is more positive, at least concurrently. However, when adolescents’ perceptions were *more* negative than their parent’s perceptions, adolescents also reported worse psychological adjustment, both concurrently and over time. In sum, adolescent–parent congruence and incongruence appear to meaningfully relate to adolescents’ psychological adjustment, helping to shed light on how the family environment comes to influence adolescent functioning.

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statistical approach, and provided critical revisions to the manuscript; AD participated in the design of the study and provided critical revisions to the manuscript; EC conceived of the study design and coordination, and provided critical revisions to the manuscript. All authors read and approved the final manuscript.

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**Ethical Approval** All study procedures were approved by the University of British Columbia behavioral research ethics review board and were in accordance with the 1964 Helsinki declaration and its later amendments.

**Informed Consent** Informed consent was obtained from parent participants and assent was obtained from adolescent participants.

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