

Abstract

Because loneliness is a subjective experience, it is often examined using self-reports. Yet, researchers have started to use other-reports to examine loneliness. As previous research suggests that discrepancies between self- and other views might have important implications for adolescents' mental health, the current study examines discrepancies in multi-informant reports on adolescents' loneliness in relation with prosocial behavior, aggression, and adolescents' parent-related loneliness. The sample consisted of 374 mother-adolescent dyads and 318 father-adolescent dyads (41.80% male, $M_{age} = 15.67$ years, $SD = 1.25$). Results indicated that informants used different reference points to assess adolescents' peer-related loneliness, but were otherwise comparable. Moreover, informant discrepancies were associated with greater adolescents' reported parent-related loneliness. The current study did not provide evidence that discrepancies were related to prosocial or aggressive behavior. The current study adds to the notion that other-reports on loneliness show substantial convergence with self-reports. In addition, this study indicates that the discrepancy between other- and self-reports on loneliness holds valuable information for adolescent socio-emotional adjustment.

Keywords: Loneliness; Discrepancies; Parent-reports; Aggressive Behavior; Prosocial Behavior; Adolescents

22

Introduction

23 Loneliness is a negative emotional reaction to the experience of a discrepancy between
24 the perceived and the desired quantity or quality of social relations (Perlman & Peplau, 1981).
25 By definition, therefore, it represents a subjective, internal experience, for which self-reports
26 are deemed most appropriate (Heinrich & Gullone, 2006). Yet, some lonely individuals
27 exhibit certain observable characteristics, such as being less trusting or warm (Tsai & Reis,
28 2009), having lower social skills (Lodder, Goossens, Scholte, Engels, & Verhagen, 2016),
29 having fewer friends (Qualter & Munn, 2005), and being more shy (Vanhalst, Luyckx, &
30 Goossens, 2014). These observable characteristics of lonely individuals suggest that
31 loneliness could be assessed using other-reports instead of self-reports. The only study that
32 included and compared multiple informants on late adolescent loneliness showed that self-
33 reports and reports from parents, peers, and partners are moderately to highly correlated
34 (Luhmann, Bohn, Holtmann, Koch, & Eid, 2016). This indicates that other-reports may be
35 useful to some extent, but it remains unclear what the added value is of these other-reports
36 compared to self-reports.

37 It might be especially interesting to examine what it means if self-reports and other-
38 reports on loneliness are discrepant. Earlier research indicated that, in general, discrepancies
39 between reporters may hold valuable information that predicts adolescent adjustment above
40 and beyond individual informant reports (Vazire & Carlson, 2011). For instance, discrepant
41 reports of adolescent and parents on family functioning have been related, above and beyond
42 individual reports, to lower self-competence (Ohannessian, Lerner, Lerner, & von Eye, 2000),
43 increased adolescents' anxiety and increased alienation from the parents (Maurizi, Gershoff,
44 & Aber, 2012). Using state-of-the-art statistical analyses, in this article we examined if and
45 how discrepancies between self- and parent-reports of adolescents' peer-related loneliness
46 were related to adolescents' interpersonal functioning in the peer context, both positively (i.e.,

47 prosocial behavior) and negatively (i.e., aggressive behavior), and to their relation with the
48 respective parent (i.e., parent-related loneliness).

49 **Discrepancy Assessment**

50 In order to establish whether there are discrepancies between two informants regarding a
51 certain behavior, several methods have been used in the past. In the first approach, informants
52 report on parallel items with slight differences in content (De Los Reyes et al., 2015). The
53 well-known Child Behavior Checklist (CBCL) and Youth Self Report (YSR) are considered
54 to be such parallel questionnaires, as the CBCL item “Underactive, slow moving, or lacks
55 energy”, for example, is supposed to match the YSR item “I don’t have much energy”.

56 However, on these kinds of parallel measures, it remains unclear to what extent discrepancies
57 are the result of different informant perspectives versus variability in item content. In the
58 second approach, discrepancies are examined by using “identical items” for all informants
59 (De Los Reyes et al., 2015). A frequently used approach for such questionnaires is changing
60 the “I” in adolescent questionnaires to “my child” in parent questionnaires, or vice versa. Not
61 surprisingly, informants are more likely to agree on identical items than parallel items
62 (average correlation of .45 versus .30; Achenbach, Krukowski, Dumenci, & Ivanova, 2005).

63 The use of identical items does not guarantee comparability of the informant reports (De
64 Los Reyes & Ohannessian, 2016). For instance, if children consistently interpret certain
65 questions differently than their parents do, discrepancies in scores may reflect differences in
66 interpretation of the question rather than actual differences in the observed behavior.
67 Therefore, it is important to know whether discrepancies between adolescents’ and parents’
68 reports regarding adolescents’ peer-related loneliness reflect actual differences in perspective
69 on adolescents’ loneliness instead of differences in the use or interpretation of the
70 questionnaire.

71 Comparability of informant reports, which is referred to as measurement invariance, is
72 usually examined on three levels (van de Schoot, Lugtig, & Hox, 2012). On the first level,
73 researchers examine whether parents and adolescents conceptualize the assessed construct,
74 that is, peer-related loneliness, in the same way (i.e., configural invariance). On the second
75 level, researchers examine whether parents and adolescents agree in what they see as the most
76 important indicator of the assessed construct (i.e., metric invariance). For example, it might be
77 easier for parents to obtain information about observable symptoms compared to non-
78 observable symptoms (e.g., De Los Reyes et al., 2015). Parents would then be more likely to
79 attach greater value to observable indicators (e.g., behavior), whereas adolescents would be
80 more likely to attach greater value to non-observable indicators (e.g., emotions; Carlston &
81 Ogles, 2006). On the third level of measurement invariance, researchers examine whether
82 parents and adolescents might use similar reference points for what they consider as typical
83 behavior regarding peer-related loneliness (i.e., scalar invariance). It has been suggested that
84 adolescents are more likely to use behaviors of their friends and peers in unsupervised
85 contexts as reference point. Parents, by contrast, are more likely to use their own behavior
86 during adolescence or the behavior of their adolescents' peers in supervised contexts as
87 reference point (Carlston & Ogles, 2006). Some deviations in the concept's indicators are
88 allowed in order to make meaningful comparisons between parent- and adolescent-reports,
89 which means that partial invariance is sufficient for meaningful comparison (van de Schoot et
90 al., 2012).

91 In addition to different ways to assess informant comparability, previous studies have
92 also adopted several approaches to analyze informant discrepancies (De Los Reyes &
93 Ohannessian, 2016). These analyses are usually based on inter-informant agreement, such as
94 difference scores or comparison of informant mean scores. However, these methods reduce
95 reliability of the measures, are ambiguous in their interpretation, place unwanted

96 mathematical constrains upon the data (e.g., adolescents' and parents' reports are assumed to
97 be equal in size, but opposite in direction), and confound the effects of individual informants'
98 reports (e.g., Laird & De Los Reyes, 2013). Polynomial regression analysis with surface
99 modeling has been proposed as a viable alternative for using difference scores (Edwards,
100 2002). Compared to difference scores, the added value of polynomial regression analysis is
101 that it can be used to examine both the degree to which parents' reports differ from
102 adolescents' reports and the direction of this difference (i.e., does it matter if the adolescents'
103 report is higher compared to the parents' report or vice versa) regarding a particular outcome.

104 **Predictive Utility of Informant Discrepancies Regarding Adolescent Loneliness**

105 It has been suggested that others may notice behavioral changes related to loneliness,
106 such as social withdrawal and depressive symptoms, and perceive them as signs of loneliness
107 and as indications that the lonely individual needs help (Cacioppo, Cacioppo, & Boomsma,
108 2014). This suggests that the perspective of others regarding the individual's loneliness
109 matters, as it determines whether or not the individual receives help. Moreover, it suggests
110 that discrepancies between the perspective of self and others regarding the individual's
111 loneliness might be disadvantageous for the individual. The current study, therefore, examines
112 self- and other-discrepancies regarding adolescents' loneliness, and whether such
113 discrepancies are related to adolescents' functioning. To examine adolescents' functioning,
114 we selected variables related to the parental context (i.e., parent-related loneliness) as well as
115 the peer context (i.e., aggressive and prosocial behavior), as both contexts are crucial to
116 adolescents' development (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Steinberg,
117 & Morris, 2001).

118 First, despite adolescents' striving for greater autonomy from their parents, parents
119 remain important socializing agents (Steinberg, & Morris, 2001). Parents are key providers of
120 attachment, guidance, reassurance of worth, and opportunities for nurturance (Weiss, 1973).

121 When these provisions are not being met, adolescents might experience loneliness in relation
122 to their parents (i.e., parent-related loneliness). It should be noted that parent-related
123 loneliness is not limited to low quality of the parent-adolescent relationship, as parent-related
124 loneliness also implies additional feelings of alienation and abandonment (Goossens, 2016).
125 Besides unmet provisions, parent-related loneliness might also result from discrepant parent-
126 adolescent views regarding adolescents' loneliness. More specifically, it has been suggested
127 that discrepancies between self and other perceptions regarding an individual's adjustment
128 can result in feeling alienated from the other person, as well as unsupported, and unaccepted
129 by the other person (Goodman, De Los Reyes, & Bradshaw, 2010). In this study, therefore,
130 we hypothesized that parent-adolescent discrepancies regarding adolescents' peer-related
131 loneliness are related to increased parent-related loneliness, as reported by the adolescent.

132 Second, it has been suggested that loneliness results in more negative interpersonal
133 behaviors in the peer context, such as increased aggressive behavior and decreased prosocial
134 behavior, through impaired cognitive processes (Twenge, Baumeister, DeWall, Ciarocco, &
135 Bartels, 2007). More specifically, the cognitive processes of lonely individuals are focused on
136 their own needs and preservation (Cacioppo & Hawkley, 2009; Qualter et al., 2015), which
137 does not necessarily result in "nice" or positive behavior towards others (Twenge et al., 2007).
138 Moreover, the bias in cognitive processes of lonely individuals shows similarities with the
139 cognitive bias of aggressive individuals (e.g., Crick & Dodge, 1994). Indeed, experimental
140 studies showed that priming loneliness led to less prosocial behavior (Twenge et al., 2007)
141 and more aggressive behavior (Twenge, Baumeister, Tice, & Stucke, 2001). In addition, it has
142 been suggested that discrepant self and other perspective regarding loneliness might also
143 result in increased aggressive behavior and decreased prosocial behavior. That is, self-
144 verification theory suggests that perceptions of others that are discrepant with one's own
145 perceptions pose a threat for one's self-concept, even if the perception of others is more

146 favorable (Swann, 1990). Individuals can blame the other person for the difference in
147 perspective in order to protect themselves against the self-concept threat, which is likely to
148 result in hostility and anger towards the other person (Tracy & Robins, 2003). In this study,
149 we hypothesized that parent-adolescent discrepancies regarding adolescents' peer-related
150 loneliness are related to increased aggressive behavior and decreased prosocial behavior.

151 **The Present Study**

152 In the current study, we examined whether parent-adolescents discrepancies regarding
153 adolescents' peer-related loneliness whether relation to adolescents' parent-related loneliness,
154 as indicator of the relationship with the reporter, and to aggressive behavior and prosocial
155 behavior, as indicators of interpersonal behaviors in relation to peers. Moreover, we examined
156 comparability between adolescents' and parents' reports on identical items regarding
157 adolescents' peer-related loneliness. We also examined the comparability of mothers' and
158 fathers' reports with each other, as it might provide greater insight into potentially different
159 results for adolescent-mother and adolescent-father dyads.

160 We expected that adolescents' peer-related loneliness is related adolescents reporting
161 increased parent-related loneliness (Maes, Van den Noortgate, & Goossens, 2015), increased
162 aggressive behavior (Twenge et al., 2001), and decreased prosocial behavior (Twenge et al.,
163 2007). Moreover, we expected that discrepancies between parents and adolescents on their
164 reports regarding adolescents' peer-related loneliness to be related to increased feelings of
165 loneliness in relation to that person (Goodman et al., 2010). In line with the self-verification
166 theory (Swann, 1990), we further expected that parent-adolescent discrepancies regarding
167 adolescents' peer related loneliness would be related to an increase in aggressive behavior and
168 decrease in prosocial behavior.

169 **Method**

170 **Participants and Procedure**

171 Data for this study were collected in third to sixth grade of three secondary schools in
172 the Dutch-speaking part of Belgium (comparable to US Grades 9 through 12). Two weeks
173 before the start of the study, parents were informed about the study through a letter, and they
174 were provided with the researchers' full contact information. The letter also requested consent
175 for the parents' own and their child's participation. On the day of data collection in the
176 school, all adolescents received a letter describing the study, and were asked to indicate
177 whether they wanted to participate or not. Adolescents who were willing to participate and
178 whose parents did not object to participation filled out the questionnaires in their classroom,
179 supervised by trained undergraduate students. The study consent process and procedures were
180 approved by the university's Institutional Review Board.

181 In the full sample, 657 adolescents participated. Because of our interest in the mother-
182 adolescent and father-adolescent dyads, 239 adolescents without a participating parent were
183 not included in subsequent analyses. In addition, 26 cases were dropped from the study,
184 because only one parent report but no adolescent reports or report of the other parent were
185 available. One additional participant was dropped, because with the exception of 6 parent- and
186 peer-related loneliness items, no adolescent information was available for the other variables
187 of interest. The final analytic sample consisted of 301 adolescents (76.98%) for whom both
188 parents participated, 73 adolescents (18.67%) for whom only the mother participated, and 17
189 adolescents (4.34%) for whom only the father participated. This resulted in 374 mother-
190 adolescent dyads and 318 father-adolescent dyads. The adolescents (41.79% male) were
191 between 13 and 19 years old, with an average age of 15.67 years ($SD = 1.25$). The majority
192 (85.09%) lived with both their parents, 13.11% of the adolescents had divorced parents and
193 for 1.80% of the adolescents one of the parents was deceased. Adolescents from traditional
194 families (i.e., two biological parents) did not differ from adolescents from non-traditional
195 families (i.e., living with one biological parent or in constituted families) in their self-reported

196 parent-related loneliness ($t(387) = 1.04, p = .298$), self-reported peer-related loneliness ($t(387)$
197 $= -1.48, p = .140$), mother-reported peer-related loneliness ($t(370) = -.77, p = .440$) and
198 prosocial behavior ($t(387) = -.77, p = .440$). Adolescents from traditional families scored
199 higher on aggressiveness ($t(387) = -2.21, p = .028$) and father-reported peer-related loneliness
200 ($t(315) = -2.38, p = .022$) than adolescents from non-traditional families.

201 For the mother-adolescent dyads, 94.12% had complete data, 4.55% had one item
202 missing, and 1.33% had a missing on a few items. For the father-adolescent dyads, 93.71%
203 had complete data, 4.72% had one item missing, and 1.57% had a missing on a few items.
204 Little's MCAR Test (Little, 1988), using expectation maximization estimation, revealed a
205 normed χ^2 of 1.15, which indicated that the data was missing at random (Ulman, 2013).
206 Therefore, we imputed missing data using relative means substitution (Raaijmakers, 1999) in
207 SPSS before analyzing the data.

208 **Measures**

209 **Loneliness.** Adolescents' loneliness was measured using the peer- and parent-related
210 loneliness subscales of the Loneliness and Aloneness Scale for Children and Adolescents
211 (LACA; Goossens, 2016). Both scales consist of 12 items (e.g., "I feel sad because I do not
212 have friends", and "I feel left out by my parents", respectively), which the adolescents rated
213 on a 4-point Likert scale, ranging from 1 (*never*) to 4 (*often*). The questionnaire has been
214 shown to be a valid (Goossens, 2016) and reliable measure of loneliness in various countries
215 and age groups (Maes et al., 2015). In addition, parents reported about their child's peer-
216 related loneliness. A new scale was developed for that purpose by rewording all items of the
217 peer-related loneliness subscale of the LACA (i.e., by replacing "I" with "My child"; see
218 Table 1). An example item is "My child has fewer friends than others". Parents did not report
219 on parent-related loneliness. Cronbach's alpha for peer-related loneliness as reported by the
220 adolescent, mother, and father were excellent, $\alpha = .88$, $\alpha = .95$, and $\alpha = .95$ respectively.

221 Cronbach's alpha for parent-related loneliness as reported by the adolescent was also
222 excellent, $\alpha = .91$.

223 **Prosocial behavior.** Adolescents' prosocial behavior was assessed with 6 items that
224 tapped into their helpfulness, supportiveness, and cooperativeness (Caprara, Steca, Zelli, &
225 Capanna, 2005). Adolescents rated these items (e.g., "I try to help others") on a 5-point Likert
226 scale ranging from 1 (*almost never true*) to 5 (*almost always true*). There is some evidence for
227 the validity of this questionnaire in adolescence (Caprara, Alessandri, & Eisenberg, 2012).
228 Cronbach's alpha was good, $\alpha = .82$.

229 **Aggressive behavior.** Six items from the Aggression Behavior subscale of the Youth
230 Self-Report (Achenbach, McConaughy, & Howell, 1987) were used to assess aggressive acts
231 towards others. This short form of the aggressive behavior subscale proved to be a reliable
232 and valid measure in previous research (Soenens, Sierens, Vansteenkiste, Dochy, &
233 Goossens, 2012). Example items are "I am mean to others" and "I destroy things belonging to
234 others". The items were answered on a 5-point Likert scale ranging from 1 (*almost never true*)
235 to 5 (*almost always true*). Cronbach's alpha was good, $\alpha = .83$.

236 **Statistical Analyses**

237 Measurement invariance was tested using stepwise CFA analysis (van de Schoot et al.,
238 2012). Full information maximum likelihood (FIML) was used to account for missing data as
239 result of the different number of fathers and mothers that participated. In the first step,
240 configural invariance was examined by testing a baseline latent factor model in which items
241 should be associated with the same latent factor across informants. A good fit indicates that a
242 similar conceptual framework for peer-related loneliness is used across adolescents, fathers,
243 and mothers. In the second step, metric invariance was examined by constraining factor
244 loadings to be equal for fathers, mothers, and adolescents, as well as for each dyad separately.
245 A non-significant change in model fit in comparison to the configural model indicates that

246 informants ascribe similar degrees of importance to the various indicators of peer-related
247 loneliness. In the last step, scalar invariance was examined by constraining the intercepts to be
248 equal, in addition to the already constrained factor loadings, for fathers, mothers, and
249 adolescents, as well as for the dyads separately. A non-significant change in model fit in
250 comparison to the metric invariant model indicates that levels and scaling of the items are
251 similar across informants. If adding constrains to the model significantly worsens the model
252 fit, one can establish partial measurement invariance by freeing parameters that do not show
253 invariance. At least two parameters should be invariant for each latent construct for partial
254 invariance to hold (van de Schoot et al., 2012). We used χ^2 , CFI, (with a value of .90 regarded
255 as the cut-off for a good fitting model) and RMSEA (with a cut-off value of .05) to assess
256 model fit in the configural model (Hu & Bentler, 1999). In order to select the most
257 parsimonious model (i.e., metric or scalar invariance), the change in χ^2 should not be
258 significant and the change in CFI and RMSEA should be less than .01 (Chen, 2007).

259 We examined whether similarities and differences in adolescents' and parents' reports
260 on adolescents' peer-related loneliness were related to adolescents' parent-related loneliness,
261 prosocial behavior, and aggressive behavior using polynomial regression analysis. In order to
262 perform a polynomial regression analysis, the adolescents' and parents' reports on peer-
263 related loneliness were centered around their mid-point (i.e., 2.5; Edwards, 2002). The
264 polynomial regression model was estimated with linear effects of the adolescent report (X)
265 and the parent report (either father or mother; Y), an interaction between the parent and
266 adolescent report (XY), and the squared term of the adolescent report (X²) and the parent
267 report (either father or mother; Y²) regressed on parent-related loneliness, prosocial behavior,
268 and aggressive behavior. The resulting equation for any given outcome is $b_0 + b_1X + b_2Y +$
269 $b_3X^2 + b_4XY + b_5Y^2 + e$.

270 Only when the R^2 was significant, the polynomial regression analyses were evaluated
271 on their surface test values (Edwards, 2002). More specifically, the regression coefficients
272 from the polynomial regression analysis were used to calculate the slope and curvature for the
273 line of perfect agreement (a_1 and a_2 respectively), that is, the line where adolescents' and
274 parents' reports were similar, as well as the slope and curvature for the line of disagreement
275 (a_3 and a_4 respectively), that is, the line where adolescents' and parents' reports were
276 different.

277 A significant slope along the line of perfect agreement ($a_1 = b_1 + b_2$) indicates that the
278 outcome increases (positive a_1) or decreases (negative a_1) when the level of peer-related
279 loneliness, as reported by both adolescent and parent, increases. Because we expect more
280 peer-related loneliness to be related to more parent-related loneliness, more aggressive
281 behavior and less prosocial behavior, a positive a_1 is expected for adolescents' parent-related
282 loneliness and aggressive behavior, whereas a negative a_1 is expected for prosocial behavior.

283 A significant curvature along the line of perfect agreement ($a_2 = b_3 + b_4 + b_5$) indicates that
284 the slope along the line of perfect agreement is non-linear. More specifically, such a curvature
285 indicates that the outcomes increase (positive a_2) or decrease (negative a_2) more sharply when
286 peer-related loneliness, as reported by adolescent and parent, increases. We did not have any
287 expectations regarding non-linear effects.

288 A significant slope along the line of disagreement ($a_3 = b_1 - b_2$) indicates that the
289 outcome is higher when adolescents report higher peer-related loneliness than their parents
290 (positive a_3) or that the outcome is higher when parents report more peer-related loneliness
291 than adolescents (negative a_3). We expect that parent-adolescent discrepancies in general
292 threaten adolescents' self-concept and are thus, regardless of their direction, related to
293 adolescents' parent-related loneliness, aggressive behavior, and prosocial behavior. In other
294 words, we expect that a_3 is significant but do not have specific hypotheses about its direction

295 (i.e., positive or negative). A significant curvature along the line of disagreement ($a_4 = b_3 - b_4$
296 $+ b_5$) indicates that the slope along the line of disagreement is non-linear. More specifically,
297 such a curvature indicates that the outcomes increase (positive a_4) or decrease (negative a_4)
298 more sharply when the discrepancy between adolescent and parent reports increases (see also
299 Shanock, Baran, Gentry, Pattison, & Heggstad, 2010). We did not have any expectations
300 regarding non-linear effects of parent-adolescent discrepancies.

301 **Results**

302 **Descriptive Statistics**

303 Table 2 summarizes the correlations, means, and standard deviations for all measures.
304 Adolescents' and parents' reports on adolescents' peer-related loneliness were strongly and
305 positively correlated. Adolescents' report of parent-related loneliness was positively
306 correlated with adolescents' reports on adolescents' peer-related loneliness, but it was not
307 correlated with parent's reports on adolescents' peer-related loneliness. In addition, parent-
308 related loneliness was negatively correlated with prosocial behavior and positively correlated
309 with aggressive behavior. Adolescents' and fathers' reports on adolescent peer-related
310 loneliness, but not mothers' reports, were related to prosocial behavior. Neither adolescents',
311 fathers' nor mothers' reports on adolescent peer-related loneliness were correlated with
312 aggressive behavior.

313 **Measurement Invariance**

314 Measurement invariance was tested to examine whether adolescents and parents
315 interpreted the loneliness items in a similar manner. When configural invariance was tested,
316 the model fit was not sufficient according to predetermined cut-off scores, $\chi^2(591) = 2192.11$,
317 $p < .001$, RMSEA = .08, CFI = .83. Modification indices indicated that, for all informants,
318 Item 1 should be correlated with Item 5, Item 3 with Item 4, Item 8 with Item 12, and Item 9
319 with Item 10. These results indicated that these items have similar content (see Table 1). The

320 fit for the revised configural model that incorporated these error correlations was acceptable,
321 which indicates that adolescents, fathers, and mothers used a similar framework to assess
322 adolescents' peer-related loneliness (see Table 3).

323 Metric invariance was tested by constraining the factor loadings. The change in χ^2 was
324 significant when the factor loadings of all informants, informants of the adolescent–father
325 dyad, or informants of the adolescent-mother dyad were constrained to be equal. However,
326 the change in RMSEA and CFI was very small ($< .01$) for the metric invariant model in
327 comparison to the configural invariant model. Therefore, we concluded that adolescents' peer-
328 related loneliness seemed to be metric invariant across informants. It should be noted that the
329 factor loadings within the mother-father dyad could be constrained without significant
330 changes in any of the fit statistics in comparison to the configural model (see Table 3).

331 Subsequent scalar invariance was tested by simultaneously constraining factor
332 loadings and intercepts to be equal across informants. Both χ^2 and CFI showed a significant
333 decrease in model fit for the scalar invariant model in comparison to the metric invariant
334 model when all informants, informants of the adolescent–father dyad, or informants of the
335 adolescent-mother dyad were constrained to be equal (see Table 3). In other words, we were
336 unable to establish scalar invariance across all informants or between adolescent-parent
337 dyads. The model fit of the scalar invariant model did not significantly worsen in comparison
338 to the metric invariant model for the father-mother dyad. Therefore, scalar invariance was
339 only supported for the mother-father dyad. These findings imply that, although both parents
340 did use the same reference points to assess adolescents' peer-related loneliness, adolescents
341 and parents did not use the same reference points. It should be noted that scalar invariance is
342 required when comparing means, whereas metric invariance has been deemed sufficient for
343 regression analysis (van de Schoot et al., 2012). Thereby, the lack of scalar invariance is not

344 problematic for the subsequent discrepancy analyses, as these analyses are based on
345 regression coefficients rather than means of the variables.

346 **Parent-Adolescent discrepancies**

347 We examined how (differences between) adolescents' and parents' reports on
348 adolescents' peer-related loneliness were related to the various outcome variables. The results
349 of the polynomial regression analyses are displayed in Table 4. For both adolescent-mother
350 and adolescent-father dyads the R^2 for aggressive behavior was not significant, so no
351 subsequent analyses were conducted for that variable. R^2 was significant parent-related
352 loneliness, as reported by the adolescent, and prosocial behavior. The four surface test values
353 (i.e., a_1 , a_2 , a_3 , and a_4) were examined for adolescents' parent-related loneliness and prosocial
354 behavior. For both outcomes, the results were similar for mother-reported loneliness and
355 father-reported loneliness.

356 For parent-related loneliness, the slope along the line of incongruence (a_3) was
357 significant, but the curve (a_4) was not. This pattern of findings indicated that when
358 adolescents reported higher levels of peer-related loneliness than their parents (i.e., when
359 parents underestimated their child's feelings of loneliness), adolescents experienced higher
360 parent-related loneliness (see Figure 1). There was no evidence suggesting that peer-related
361 loneliness was related to parent-related loneliness if parents and adolescents agreed about the
362 level of peer-related loneliness, because the slope (a_1) and curve (a_2) along the line of perfect
363 agreement were not significant.

364 For prosocial behavior, we found no significant slope (a_3) or curve (a_4) for the line of
365 incongruence. This pattern of findings meant that we found no evidence suggesting that
366 discrepancies between parents' and adolescents' reports on adolescents' peer-related
367 loneliness were related to prosocial behavior. The positive a_2 indicated that there was an
368 upward curving along the line of perfect agreement. This result indicated that when parents

369 and adolescents agreed about the level of peer-related loneliness, prosocial behavior was
370 highest for adolescents who experienced either very low or very high feelings of loneliness
371 (see Figure 2).

372 **Discussion**

373 Because loneliness is a subjective experience, it is often examined using self-reports
374 (Heinrich & Gullone, 2006). However, as close others can observe behavioral changes
375 resulting from loneliness (Cacioppo et al., 2014), they could be expected to be able to report
376 on others' loneliness. A previous study indeed indicated that reports of other informants than
377 the self, such as parents, could be used to assess loneliness (Luhmann et al., 2016). However,
378 it remained unclear whether the reports of different informants are comparable and what the
379 added value is of these other-reports in addition to self-reports. In the current study, we
380 examined the comparability of self- and parent-perspectives regarding adolescents' peer-
381 related loneliness. In addition, we examined whether discrepancies in perspectives were
382 related to adolescent reported parent-related loneliness, prosocial behavior, and aggressive
383 behavior.

384 The current study examined the comparability between self- and other-reports and the
385 additive value of other-reports over self-report. First, the results indicated that parents and
386 adolescents use the same framework to conceptualize peer-related loneliness and agree on the
387 importance of the various indicators of peer-related loneliness. Second, adolescents
388 experienced more self-reported parent-related loneliness when they disagreed with their
389 parents on their peer-related loneliness. Third, when adolescents and parents were in
390 agreement about adolescents' peer-related loneliness, both the least and the most lonely
391 adolescents reported the highest levels of prosocial behavior. Fourth, the results provided no
392 evidence to suggest that peer-related loneliness, as reported by adolescents, fathers, and
393 mothers, was related to adolescents' aggressive behavior. These results suggest that the

394 discrepancies between adolescents' and parents' reports on adolescents' peer-related
395 loneliness might be important for adolescents' socio-emotional functioning, but not
396 necessarily relate to adolescents' behavior.

397 **Comparability Across Informants**

398 We tested whether discrepancies between adolescents' and parents' reports on peer-
399 related loneliness reflected actual differences in perspective or differences in interpretation of
400 the questionnaire. Overall, our findings suggest that self- and other-reports on loneliness are
401 relatively comparable. That is, our results indicated that all informants used the same
402 conceptual framework for peer-related loneliness and similarly valued the various observable
403 indicators (e.g., "I have/My child has fewer friends than others") and non-observable
404 indicators (e.g., "I feel/My child feels alone at school") of peer-related loneliness. This
405 finding contradicts the prevailing assumption in the literature that observable indicators are
406 more important for parents than non-observable indicators, whereas the reverse holds for
407 adolescents (Achenbach et al., 2005). Moreover, in line with the study by Luhmann et al.
408 (2016), our findings suggest that self and other reports show substantial convergence.

409 We also found that parents and adolescents used different reference points to assess
410 adolescents' peer-related loneliness (i.e., lack of scalar invariance), whereas fathers and
411 mothers seem to apply the same reference points. This finding seems in line with previous
412 research suggesting that reports of "observer informants" (i.e., fathers, mothers, and teachers)
413 are more comparable with each other than with adolescent self-reports (e.g., De Los Reyes &
414 Kazdin, 2005). Thereby, the findings underline the notion that even though "identical" items
415 might be used, informant reports might still not be completely comparable. Moreover, the
416 differences in reference points might be a reason for discrepancies between the adolescents'
417 and parents' reports.

418 **Informant Discrepancies and Adolescent Adjustment**

419 This study showed that adolescents predominantly experienced parent-related loneliness
420 when they reported higher levels of peer-related loneliness than their parents. This finding is
421 in line with the idea that discrepancies between self and others' perceptions are related to
422 feeling alienated from, unsupported and unaccepted by the other person (Goodman et al.,
423 2010). Although we proposed that the discrepant views of parents and adolescents result in
424 parent-related loneliness, the reverse could also hold true, that is, that parent-related loneliness
425 could result in discrepant views. That is, the parent-adolescent discrepancies might arise from
426 a reduction in communication due to the feelings of alienation. Moreover, poor relationship
427 quality might be partially manifested in both parent-adolescent discrepancies and parent-
428 related loneliness. Yet, poor communication, and subsequent discrepant views, are unlikely to
429 result solely from poor relationship quality, as lonely individuals generally show decreased
430 self-disclosure (e.g., Burke, Woszidlo, & Segrin, 2012). An interesting avenue for future
431 research is to examine to what extent the validity of other reports is threatened by
432 characteristics of the relationship and characteristics of loneliness.

433 Although parent-adolescent discrepancies were not related to prosocial behavior, the
434 results of this study further revealed a complex relation between loneliness and prosocial
435 behavior. The polynomial regression results suggest that both the least and the most lonely
436 adolescents show most prosocial behavior. Thereby, the current results are a first indication
437 that prosocial behaviors might have a non-linear relationship with loneliness. This duality in
438 results reflects the two opposing views in the literature. On the one hand, prosocial
439 adolescents may be less likely to experience peer-related loneliness, because they are more
440 likely to have favorable relationships (Eisenberg, Spinrad, & Morris, 2006). On the other
441 hand, feeling lonely motivates individuals to invest greater effort into their social
442 relationships, by showing increased prosocial behavior (Cacioppo et al., 2006). Future

443 research might use non-linear methods to examine the relationship between loneliness and
444 prosocial behavior.

445 The current study did not provide evidence that discrepant views on peer-related
446 loneliness was related to aggressive behavior. Although various indicators of threatened
447 belongingness needs have been related to aggressive behavior (e.g., Leary, Twenge, &
448 Quinlivan, 2006), this is not necessarily true for loneliness (e.g., Mouratidis & Sideridis,
449 2009). These findings seem to be in contrast to the idea that other perceptions discrepant of
450 one's own perception elicit an aggressive response because it threatens the self (Swann, 1990;
451 Tracy & Robins, 2003). Moreover, these findings suggest that the cognitive bias associated
452 with loneliness does not necessarily result in aggressive behaviors, despite of the similarities
453 with the cognitive bias of aggressive individuals (e.g., Crick & Dodge, 1994). Interestingly,
454 adolescent reported parent-related loneliness was related to aggressive behaviors. This
455 underlines the importance of examining relationship-specific forms of loneliness, as these
456 different forms are differentially related to adolescents' adjustment (see also Lasgaard,
457 Goossens, & Elklit, 2011; Maes, Vanhalst, Spithoven, Van den Noortgate, & Goossens,
458 2016).

459 **Strengths and Limitations**

460 By using polynomial regression analysis with surface modeling, this study overcomes
461 the many shortcomings of difference or aggregated scores, such as reduction in reliability,
462 ambiguous interpretation of results, and the unwanted mathematical constrains placed upon
463 the data (Laird & De Los Reyes, 2013). The use of both fathers' and mothers' perspectives on
464 adolescents' loneliness represents another strength of this study. Various studies already
465 indicated that fathers have an important but different role in the upbringing and socialization
466 of adolescents in comparison to mothers (Shulman & Seiffge-Krenke, 2016).

467 Despite the above strengths, some limitations should be mentioned. First, parent-related
468 loneliness, prosocial behavior, and antisocial behavior were only examined from the
469 adolescents' perspective. Preferably, fathers' and mothers' perspective on these measures
470 should also have been taken into account. Second, the generalizability of our findings might
471 be limited. That is, the sample consisted of adolescents following the academic track in
472 schools attended mainly by Caucasian middle class students. Although we have no
473 compelling theoretical reason to assume that results might be different in other samples,
474 replication in other samples is desirable. Third, we cannot draw any conclusions about the
475 causal directions of the reported relationships. Fourth, peer-related loneliness and parent-
476 related loneliness are, in contrast to aggressive behavior and prosocial behavior, part of the
477 same questionnaire. Yet, a previous study showed that peer- and parent-related loneliness are
478 distinct, but related, constructs (Maes, Klimstra, Van den Noortgate, & Goossens, 2015). In
479 addition, adolescents have been found to experience peer-related loneliness without
480 experiencing parent-related loneliness, or vice versa (Maes et al., 2016). This line of research
481 suggest peer- and parent-related loneliness can be examined as predictors of each other.

482 **Conclusion**

483 The current study examined the comparability between self- and other-reports and the
484 additive value of other-reports over self-report. Luhmann et al. (2016) were the first to
485 suggest that other-reports regarding loneliness showed substantial convergence with self-
486 report. The current study adds to this notion by using a different approach for showing that
487 reports of different informants regarding loneliness are comparable. Moreover, our study
488 suggests that discrepant views between self- and other regarding adolescents' peer-related
489 loneliness are associated with parent-related loneliness, as reported by the adolescent, but not
490 with aggressive or prosocial behavior. It might be interesting for future research to examine
491 discrepancies with other informants, such peers and romantic partners.

492

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Table 1

Original and Reworded Items of the Loneliness and Aloneness Scale for Children and Adolescents

Item	Original Questionnaire (Adolescents)	Reworded version (Parents)
1	I think I have fewer friends than others	I think that my child has fewer friends than others
2	I feel isolated from other people	I think that my child feels isolated from other people
3	I feel excluded by my classmates	I think that my child feels excluded by his/her classmates
4	I want to be better integrated in the class group	I think that my child wants to be better integrated in the class group
5	Making friends is hard for me	I think that making friends is hard for my child
6	I am afraid the others won't let me join in	I think that my child is afraid the others won't let him/her join in
7	I feel alone at school	I think that my child feels alone at school
8	I think there is no single friend to whom I can tell everything	I think there is no single friend to whom my child can tell everything
9	I feel abandoned by my friends	I think that my child feels abandoned by his/her friends
10	I feel left out by my friends	I think that my child feels left out by his/her friends
11	I feel sad because nobody wants to join in with me	I think that my child feels sad because nobody wants to join in with him/her
12	I feel sad because I have no friends	I think that my child feels sad because he/she has no friends

Table 2

Means, Standard Deviations, and Correlations of the Study Variables

Variable	1.	2.	3.	4.	5.	6.
1. L-Peer adolescent	-					
2. L-Peer father	.50***	-				
3. L-Peer Mother	.53***	.63***	-			
4. L-Parent	.10*	.02	.05	-		
5. Prosocial Beh	-.15**	-.17**	-.09	-.19***	-	
6. Aggressive Beh.	.05	-.01	.01	.29***	-.30***	-
<i>M</i>	1.57	1.67	3.06	2.95	3.95	1.52
<i>SD</i>	.50	.53	.58	.57	.56	.53

Note: L-Peer = Peer-related loneliness, L-Parent = Parent-related loneliness, Prosocial Beh. = Prosocial Behavior, Aggressive Beh. = Aggressive behavior.

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

Table 3

Fit Indices of the Various Measurement Invariance Models

Invariance model	χ^2	<i>df</i>	<i>RMSEA</i> ^a	<i>CFI</i>	$\Delta \chi^2$	Δdf	<i>p</i>	ΔCFI
<i>Configural</i>								
All	1323.45	576	.06	.923	-	-	-	-
<i>Metric</i>								
All	1381.53	600	.06	.919	58.08	24	<.001	-.004
Father-Adolescent	1355.58	588	.06	.920	32.12	12	.001	-.003
Mother-Adolescent	1367.79	588	.06	.919	44.33	12	<.001	-.004
Father-Mother	1335.87	588	.06	.922	12.42	12	.413	-.001
<i>Scalar</i>								
All	1538.456	624	.06	.905	156.93	24	<.001	-.014
Father-Adolescent	1466.03	600	.06	.910	110.46	12	<.001	-.010
Mother-Adolescent	1507.35	600	.06	.906	139.57	12	<.001	-.013
Father-Mother	1341.12	600	.06	.923	5.25	12	.949	-.001

Note: ^a $\Delta RMSEA$ are not displayed in the table as the change was always <.004.

Table 4

Discrepancy Between Adolescent- and Parent-Reports on Adolescents' Peer-Related Loneliness as Predictor of Adolescents' Parent-Related Loneliness, Prosocial Behavior and Antisocial Behavior

Variable	Parent-related loneliness						Prosocial behavior					
	Mother			Father			Mother			Father		
	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
Constant	1.72***	.07		1.68***	0.08		3.79***	0.08		3.71***	0.08	
Adolescent report (<i>b</i> ₁)	0.36**	0.13	0.35	0.37**	0.14	0.35	0.04	0.14	0.04	0.16	0.14	0.15
Parental report (<i>b</i> ₂)	-0.17	0.09	-0.20	-0.18	0.12	-0.20	0.09	0.10	0.10	-0.14	0.12	-0.15
Adolescent report squared (<i>b</i> ₃)	0.28**	0.11	0.38	0.32**	0.12	0.43	0.13	0.12	0.16	0.28*	0.12	0.36
Parental report squared (<i>b</i> ₅)	0.01	0.08	0.01	0.05	0.10	0.08	0.07	0.09	0.10	0.06	0.10	0.09
Adolescent* Parental report (<i>b</i> ₄)	-0.20	0.13	-0.28	-0.26	0.14	-0.36	0.06	0.13	0.08	-0.12	0.15	-0.17
<i>R</i> ²	.03*			.04*			.04**			.06**		
<i>Adjusted R</i> ²	.02			.02			.03			.04		
<i>F</i>	2.3			2.45			3.28			3.64		
	Coefficient	<i>SE</i>	<i>t</i>	Coefficient	<i>SE</i>	<i>t</i>	Coefficient	<i>SE</i>	<i>t</i>	Coefficient	<i>SE</i>	<i>t</i>
<i>a</i> ₁	0.19	0.12	1.63	0.19	0.13	1.41	0.13	0.12	1.09	0.02	0.13	0.14
<i>a</i> ₂	0.09	0.08	1.09	0.11	0.10	1.21	0.25	0.09	2.85**	0.21	0.09	2.35*
<i>a</i> ₃	0.53	0.20	2.67**	0.56	0.22	2.57*	-0.05	0.21	-0.24	0.31	0.22	1.37
<i>a</i> ₄	0.48	0.27	1.79	0.63	0.29	2.15*	0.14	0.28	0.49	0.46	0.3	1.57

(Table 4 continued)

	Aggressive behavior					
	Mother			Father		
	<i>B</i>	<i>SE</i>	β	<i>B</i>	<i>SE</i>	β
Constant	1.47***	0.07		1.43***	0.08	
Adolescent report (<i>b</i> ₁)	-0.12	0.13	-0.19	-0.23	0.14	-0.63
Parental report (<i>b</i> ₂)	0.10	0.10	0.10	0.19	0.12	0.15
Adolescent report squared (<i>b</i> ₃)	-0.09	0.11	-0.25	-0.05	0.12	-0.59
Parental report squared (<i>b</i> ₅)	-0.10	0.08	-0.14	0.21	0.10	-0.03
Adolescent*Parental report (<i>b</i> ₄)	-0.01	0.12	0.37	-0.17	0.15	0.21
<i>R</i> ²	.01			.02		
Adjusted <i>R</i> ²	-.01			.00		
<i>F</i>	0.66			1.21		
	Coefficient	<i>SE</i>	<i>t</i>	Coefficient	<i>SE</i>	<i>t</i>
<i>a</i> ₁	-	-	-	-	-	-
<i>a</i> ₂	-	-	-	-	-	-
<i>a</i> ₃	-	-	-	-	-	-
<i>a</i> ₄	-	-	-	-	-	-

Note: *b*₁ – *b*₅ are coefficients in the polynomial regression equation, which are used to calculate the surface test values *a*₁ – *a*₄. Subsequently, *a*₁ = (*b*₁ + *b*₂); *a*₂ = (*b*₃ + *b*₄ + *b*₅); *a*₃ = (*b*₁ – *b*₂); *a*₄ = (*b*₃ – *b*₄ + *b*₅).

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

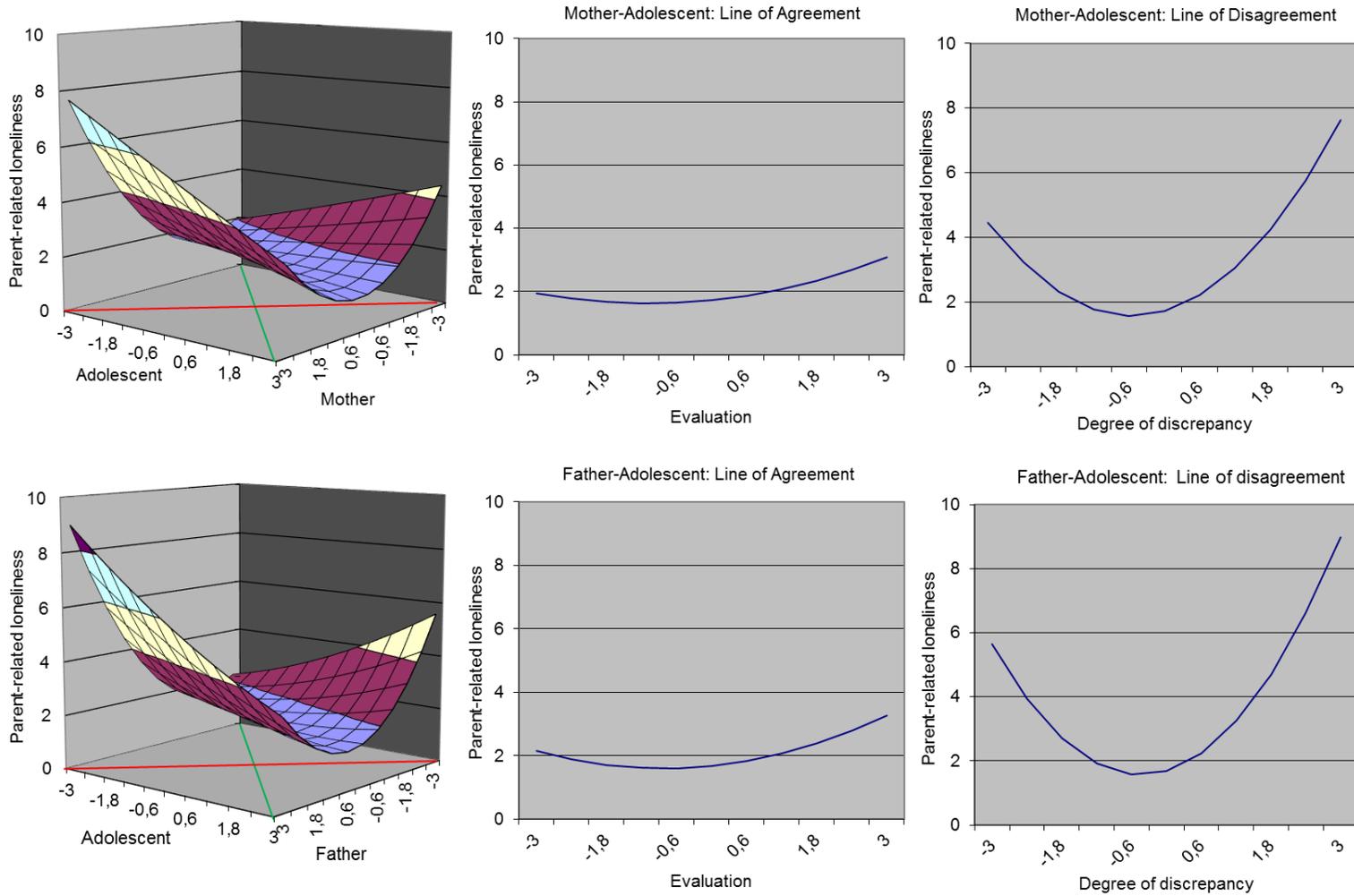


Figure 1. Response surface models for adolescent-mother (top) and adolescent-father (bottom) discrepancies on adolescents' peer-related loneliness and its relation to parent-related loneliness. Red line represents line of disagreement, green line represents the line of agreement.

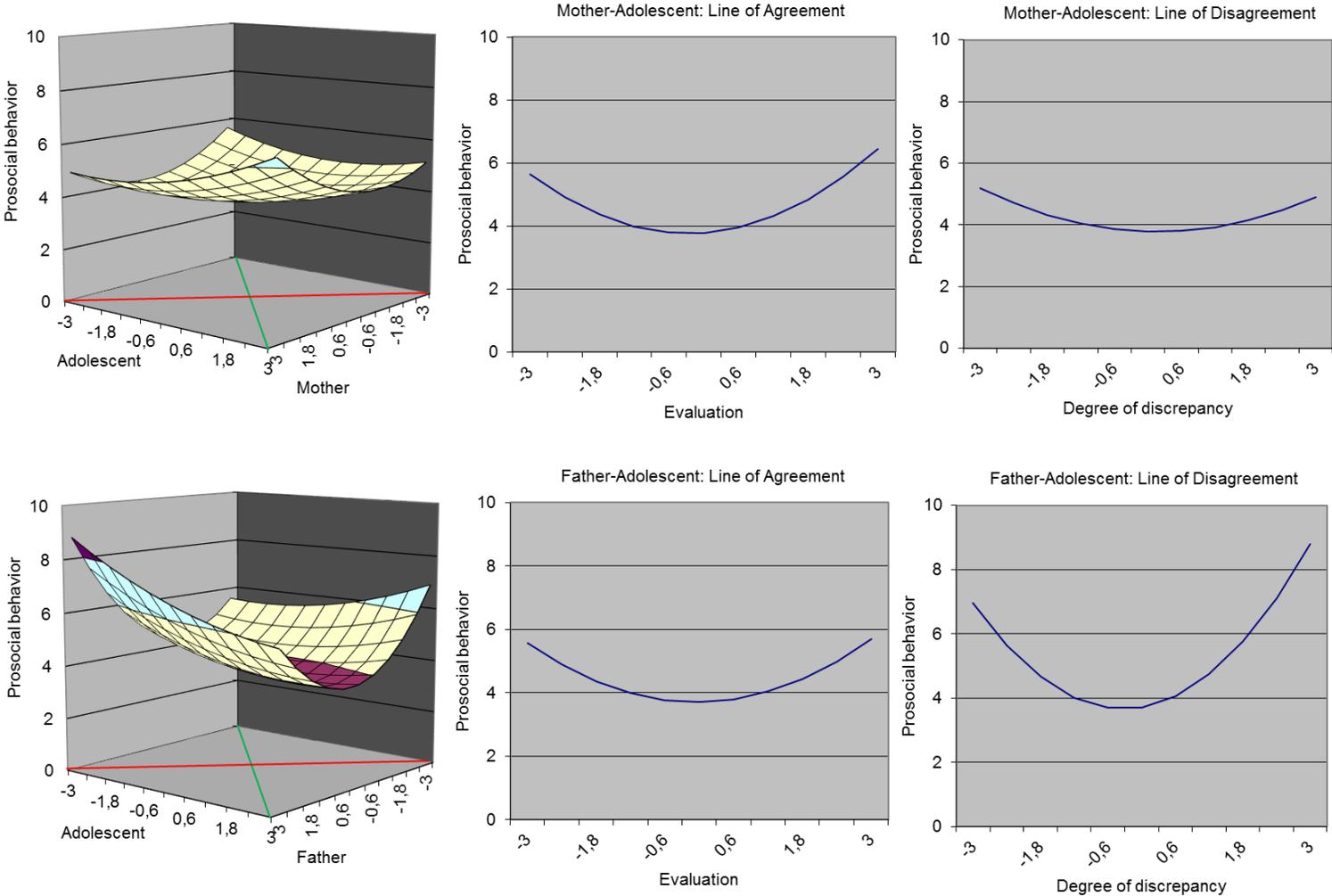


Figure 2. Response surface models for adolescent-mother (top) and adolescent-father (bottom) discrepancies on adolescents' peer-related loneliness and its relation to prosocial behavior. Red line represents line of disagreement, green line represents the line of agreement.