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Sources of Evaluation of Parental Behaviors as Predictors of Achievement Outcomes

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Abstract

Parents contribute to their children's academic achievements by supporting their basic psychological needs. Parents' need supporting behaviors (NSB) were expected to predict positive academic outcomes such as students' academic performance and persistence intentions. The present study tested the contribution of parental NSB by distinguishing which of the source of evaluation (parent or adolescent) or specific NSB (autonomy support, involvement, structure) was a better predictor of youths' academic performance and persistence intentions. This prospective study used a sample of 435 mother-adolescent dyads and 246 father-adolescent dyads, who completed two questionnaires a year apart. Results suggested that poor agreement between sources precluded the adoption of a multitrait-multimethod model. Using distinct factors for mothers, fathers, and adolescents to evaluate each NSB, different predictions were found for each outcome. Our results showed stronger contributions for paternal behaviors than for maternal ones, from the perspective of both students and their parents. These findings are examined in light of theories and research on parenting and education.

Keywords: Academic Achievement; Adolescents; Parents; Psychological Need Support; Multiple Informants

In modern societies, a high school diploma is no longer a luxury, but rather represents a critically important requirement for life success and well-being in an increasingly competitive world (Organisation for Economic Cooperation and Development, 2016). This observation reinforces the importance of achieving a better understanding of the factors most importantly related to youths' academic success. It would be hard to downplay the critical role parents play in youths' development, adaptation, and success across a variety of life periods and contexts. In the educational area, parents often act as the primary guides of their child's educational experiences (Bempchat & Shernoff, 2012), and being able to share positive and supportive relationships with one's parents has often been identified as a key predictor of positive educational outcomes (Dubow & Ippoloto, 1994; Reschly & Christenson, 2009; 2012). Not surprisingly, students fare better in school when their parents are positively involved in their schooling (Pomerantz, Kim, & Cheung, 2012).

Parental Need-Supporting Behaviors

Based on self-determination theory (SDT; Ryan & Deci, 2017), the quality of the parent-child relationship is typically examined as a function of parental need-supporting behaviors (NSB). NSB refer to parental behaviors that support the satisfaction of youth's psychological needs for autonomy (i.e., the need to feel volitional), competence (i.e., the need to feel that one's actions produce consequences), and relatedness (i.e., the need to develop close relationships with significant individuals). According to SDT, these fundamental psychological needs will be maximally fostered when parents are autonomy supportive, involved, and structuring in their interactions with their children (Ryan & Deci, 2017). Research conducted in the educational area has generally supported this assertion (see Guay, Ratelle, & Chanal, 2008; Grolnick, 2009; Pomerantz et al., 2012; Ratelle & Duchesne, 2017).

More precisely, *autonomy support* entails the recognition of the volitional nature of developing children or adolescents. It occurs when parents explain the reasons for their rules and demands, take into account youth's perspective and feelings, offer opportunities to exercise meaningful choices, hold age-appropriate responsibilities, and minimize the use of control (e.g., rewards, punishment, guilt; Ryan & Deci, 2017). *Involvement* refers to the allocation of important resources to the developing children or adolescents by the parents (Pomerantz et al., 2012; Ryan & Deci, 2017). These resources take on various forms, such as material means (e.g., providing a study desk, books and stationery), but more importantly also encompass emotional investments such as showing warmth and concern for the child, the expression of genuine interest for what is happening in her or his life, and devoting time to the child (Ryan & Deci, 2017). Finally, *structure* involves providing information (e.g., rules, expectations, feedback) to the developing children or adolescents in order to make their environments more predictable. Parental structure thereby enables youths to more efficiently self-regulate their behaviors and develop their competence in their interactions with the environment.

Achievement Outcomes Associated With Parental NSB

Parental NSB were found to contribute to youths' positive development and functioning (Ryan & Deci, 2017) as well as more specifically to a wide variety of desirable academic outcomes, ranging from school adaptation and autonomous motivation to academic attainment and success (see Guay et al., 2008; Grolnick, 2009; Pomerantz, Grolnick, & Price, 2005; Pomerantz et al., 2012; Ratelle & Duchesne, 2017). Interestingly, a recent meta-analysis of 308 studies spanning a

40-year period (1974 to 2015) found all three NSB to be positively related to academic achievement (Pinquart, 2015). Specifically, positive cross-sectional and longitudinal associations were obtained between academic performance and autonomy support, involvement, and structure (labelled autonomy granting, warmth, and behavioral control by Pinquart, 2015). However, despite these abundant research results, these three complementary parental NSB have typically not been jointly considered in the research literature focusing on academic achievement-related outcomes, making it hard to clearly disentangle their respective contributions.

Another limitation of this previous body of research comes from the relative neglect of students' intentions to persist, or actual persistence in their studies, as key interrelated educational outcomes. Importantly, research has shown that students' intentions to persist in their studies represent an important predictor of their actual school persistence (e.g., Vallerand Fortier, & Guay, 1997), suggesting that intentional persistence might represent a very useful short-term proxy for effective persistence. Still, to our knowledge, very few empirical studies have directly investigated the role of parental NSB in intentional or effective academic persistence. However, indirect support was obtained for the contribution of parental autonomy support to intentional persistence through students' psychological need satisfaction (e.g., Alivernini & Lucidi, 2011). In addition, Vallerand and his colleagues (1997) found that students who persisted in their studies tended to perceive their parents as more autonomy supportive than their classmates who dropped out of school over a one-year period. Other studies replicated the positive contribution of global ratings of parental NSB to both intentional and actual persistence (Milyavskaya et al., 2009; Ricard & Pelletier, 2016).

Methodological Issues in the Assessment of Parental NSB

In testing associations between parental NSB and educational outcomes, it is possible to consider the role of parents globally (i.e., rating "parents" in an undifferentiated manner simultaneously, or averaging scores obtained separately for mothers and fathers) or to specifically focus on the unique contribution of each parent. In the aforementioned meta-analysis, Pinquart (2015) examined the moderating role of parents' gender in the prediction of achievement outcomes, and revealed that both parents appeared to have a similar contribution. However, once again it must be reinforced that very few studies simultaneously considered the relative contribution of all three NSB, which could possibly result in a different pattern of relations for mothers and fathers (e.g., autonomy support could emerge as the key driver of achievement for fathers, whereas involvement might emerge as more important for mothers).

Sources of Evaluation for the NSB

Most of the research reviewed so far, leading to the conclusions that the contribution of maternal and paternal NSB were similar in magnitude, has mainly focused on youth's reports of their parents. However, parental perspectives on their own NSB may reveal a different picture. For instance, a recent study of adolescents revealed that fathers' contribution was twice as strong as that of mothers in the prediction of academic adjustment (Ratelle, Duchesne, & Guay, 2017). Similarly, students who reported their father as less autonomy supportive than their mother and teacher tended to present lower academic achievement than their classmates who perceived all three sources as equivalent and moderately high (Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013). Alternatively, other research evidence reveals an opposite trend, namely that maternal reports on their involvement, but not paternal reports, predicted youths' levels of academic

performance (Bogenschneider & Pallock, 2008).

Multidimensional Multi-Informant Designs

Whereas previous research has tended to focus on global ratings of parental NSB reported by the target youth, little research has simultaneously considered all three NSB, or taken into account parental reports of their own NSB. Even fewer studies have considered the joint contribution of parents and youths as sources of evaluation on these NSB. For autonomy-support, the correspondence between children and parents' evaluations was varying from a small ($r = .14$; Grolnick, Ryan, & Deci, 1991) to moderate correlation ($r = .36$; Brenning, Soenens, Braet, & Bal, 2012) for mothers and for fathers (r s between $.24$ and $.31$; e.g., Bögels, & Melick, 2004). Involvement yielded similar findings for mothers, from no relation at all ($r = .03$; Sessa, Avenevoli, Steinberg, & Morris, 2001) to a strong one ($r = .50$; Rohner, Khaleque, Riaz, Khan, Sadeque, & Laukkala, 2005) while the correspondence between fathers and their child was small ($r = .20$) to moderately high ($r = .41$; Flouri, 2004). Lastly, parent-child agreement on structure ranged from nil ($r = .04$; Logsdon, Pinto, Lajoie, Hertweck, Lynch, & Flamini, 2013) to high ($r = .61$; Merrilees, Cummings, Goeke-Morey, Schermerhorn, Shirlow & Cairns, 2011) for mothers and was relatively moderate for fathers (r s $= .19$ to $.27$; Duriez, Soenens, Neyrinck & Vansteenkiste, 2009; Van Leeuwen & Vermulst, 2004). Overall, these findings suggest that parent-child agreement is fairly inconsistent across parental behaviors as well as for each target (mother or father). Discrepancies between informants are, however, not considered to be anomalies (see De Los Reyes, Thomas, Goodman, & Kundey, 2013), and are rather viewed as meaningful and complementary (Hunsley & Mash, 2007). In fact, both perceived and self-reported NSB from mothers and fathers were found to have a unique contribution to students' school adjustment (Ratelle et al., 2017), supporting the importance of multi-informant assessments of parenting dimensions.

Approaches to modeling multi-informant data. Researchers who have examined the contribution of multiple sources of NSB evaluation have either tested the contribution of a global factor that grouped youth's perceptions and parents' self-reports of NSB (e.g., Katz, Kaplan, & Buzukashvily, 2011) or compared the relative contribution of each source on ratings of specific NSB (e.g., Ratelle et al., 2017). While each approach has merits, combining both into a single model would allow researchers to determine if it is more important to focus on the source of assessment on NSB (i.e., youths' perceptions or parents' self-reports), or on specific NSB (i.e., autonomy support, involvement, structure) regardless of the source. When modeling data from multiple informants, three different approaches can be used. The first, and most classical approach, is Campbell and Fiske's (1959) the multitrait-multimethod model (MTMM). MTMM analyses provide a way to distinguish what is unique to the source of evaluation (i.e., parent vs. youth) from what is unique to constructs being assessed (i.e., parental autonomy support, involvement, and structure), and to focus on the relative contribution of these various components to the prediction of students' achievement-related behaviors within a same model. It presents important benefits (e.g., it is the most complete approach to evaluate the convergent and discriminant validity of measures obtained from multiple sources of evaluation) but, equally important, some drawbacks. Thus, because of its computational complexity, this approach is associated with known convergence problems (e.g., Eid, 2000). In addition, this approach assumes that informants will, to some extent, converge in their evaluations (i.e., share a similar view of the trait being assessed).

As a solution to the frequent convergence problems of MTMM analyses, Eid and colleagues (Eid, 2000; Eid, Nussbeck, Geiser, Cole, Gollwitzer, & Lischetzke, 2008) proposed the correlated trait-correlated method (minus one) models, or CT-C(M-1) model. Essentially, CT-

C(M-1) models are built by removing one of the source factors from the MTMM model. Doing so results in the estimation of “trait” factors that are anchored into the assessment of these traits by the informant (e.g., the youth) corresponding to the omitted method factor (i.e. the referent informant), while also incorporating what these ratings share with the NSB ratings provided by the other informants (e.g., the parent). In CT-C(M-1) models, the remaining sources factors directly reflect what is unique to these specific sources (e.g., parental ratings) relative to the other sources (e.g., adolescents’ ratings). However, just like MTMM, these models also assume that informants will, to some extent, share a similar view of the trait being assessed. Importantly, it is important to keep in mind that MTMM and CT-C(M-1) models are essentially equivalent to one another, with CT-C(M-1) simply representing an attempt to reduce the mathematical complexity of MTMM analyses. As such, MTMM analyses provide a direct estimate of the unicity associated with each source, whereas CT-C(M-1) models re-express this unicity as a discrepancy between the target source and the referent source.

Finally, models can separate factors as a function of sources of evaluation where each “trait” is separately assessed for each informant. Such a model does not allow to disaggregate trait and method effects. However, when informants' assessments diverge from one another (i.e., share too little commonality), the separate factor approach is the only possible analytical approach that can be applied. Importantly, separate factor models should not be applied when sources share sufficient commonalities in their ratings of the traits, just like MTMM and CT-C(M-1) models are not appropriate without such commonalities. As such, contrasting these three approach provides a direct way to assess whether different informants (e.g., parents and youths) converge in their ratings of specific traits (e.g., NSB). Regardless of which if these three approached is used when dealing with multiple informants, better documenting their relative contribution is likely to have important implications for parenting research, methodologically (i.e., selecting the informants) and economically (i.e., having more informants is more costly). Because past research yielded inconsistent findings on parent-child agreement regarding parental NSB, we did not discard the possibility of using a MTMM methodology, especially with the fact that these previous results were not obtained using research designs that considered all three NSB in a same model. In the presence of minimally sufficient convergence in ratings, then there are clear advantages to using MTMM/CT-C(M-1) methodologies (and separate factor models are not appropriate) whereas in the absence of commonalities, then the separate factor approach is desirable and the MTMM/CT-C(M-1) are not appropriate. Arguably, the lowest correlations identified in our review would argue for a separate factor approach. In contrast, the largest of these correlations would argue for a MTMM/CT-C(M-1) approach.

The Present Study

This study aimed to predict students’ achievement-related outcomes (grades and intentional persistence) from parental NSB by distinguishing the contribution of sources of evaluation of these behaviors (parents vs. adolescents), regardless of the NSB, and that of the NSB themselves (autonomy support, involvement, structure), regardless of the source. This question will be investigated through the reliance on a MTMM model, illustrated in Figure 1. In this figure, the sources of evaluation are presented on the left part of the model, whereas the NSB are presented on the right part of the model. Both of these components are assessed from the same set of item ratings, allowing for a proper disaggregation of the unique variance attributed to the source of the ratings relative to the NSB themselves, as well as of the unique contribution of both components to the outcomes presented at the bottom of the figure. Due to the specific methodological design

of the current study (i.e. involving the separate recruitment of each informant) separate models will be estimated for maternal and paternal NSB.

Based on past findings showing how NSB were associated with more positive achievement-related outcomes (see Pomerantz et al., 2005, 2012; Ratelle & Duchesne, 2017), we expected factors for autonomy support, involvement, and structure (right side of the MTMM) to predict higher levels of both grades and intentional persistence. Hence, regardless of the source of evaluation, maternal and paternal NSB should support their child's achievement. Regarding predictions for the left side of the model, source factors were expected to predict higher levels of grades and intentional persistence. Yet, research showing that youths' perceptions of their parents' NSB are stronger predictors of various educational outcomes (e.g., Bogenschneider & Pallock, 2008; Brenning et al., 2012; Kins, Beyers, Soenens & Vansteenkiste, 2009; Laird, 2011; Laird & De Los Reyes, 2013; Ratelle et al., 2017) led us to expect the perceptions factor (i.e., adolescents' ratings of their mother's and father's NSB) to be more strongly predictive of achievement-related outcomes than maternal and paternal ratings of their own behaviors. The fact that youths less successfully discriminate among specific NSB than their parents (e.g., Ratelle et al., 2017) might in fact improve the strength of prediction of the global factor reflecting youths' perceptions of their parent's NSB. Also, while research comparing the contribution of parental self-reports and youths' perceptions is scarce, some findings suggest that parents' perspective accounts for unique variance in the prediction of educational outcomes (e.g., Ratelle et al., 2017). We therefore expected that global parental reports would have a unique contribution to achievement outcomes, albeit weaker than that of global adolescents' reports. In terms of the specific contribution of NSB (right part of the model), results from Pinquart's (2015) meta-analysis suggest that the relative contribution of the three behaviors to the prediction of achievement-related outcomes is likely to be similar.

Method

Participants and Procedure

Data come from a longitudinal study on the role of parents in adolescents' academic and professional development. It surveyed adolescents, their mothers, and their fathers each year, starting in secondary 3 (Time 1). We used data from Time 1 (T1) and Time 2 (T2; secondary 4). The sample included 435 mother-child dyads and 246 father-child dyads. Children's mean age at T1 was 14 years ($SD = .49$) and 54% of the sample were girls. The majority of adolescents attended a public school (78%) and never repeated a grade (92%). They were nearly all born in the province of Quebec, Canada (94%) and spoke French at home (95%). Mothers' average age was 44 years ($SD = 4.83$) and most were born in Canada (90%). They typically had 2 children and were in a relationship with the father of the child participating in the study (77% intact couples). The majority earned a high school diploma (90%) and their average family income ranged from 60 000 to 69 999\$ CAN, which corresponds to the median household income in Canada (Statistics Canada, 2013). Fathers' average age was 45.78 ($SD = 4.55$) and 85% of them earned at least a high school diploma. They were also typically born in Canada (92%).

The sample for this study was provided by the Quebec Ministry of Education and was composed of secondary 3 students. This sample was stratified on the basis of gender, geographic location (rural or urban), type of school (public or private), and socioeconomic status. Upon obtaining parental consent, adolescents, as well as their mother and father each received a questionnaire to complete individually (electronically or in paper format). A year later, participants were contacted to complete another questionnaire. To minimise the toll on family members' time,

participants were recruited individually. As a result, we ended up having very few mother-father-child triads, forcing us to focus on mother-child and father-child dyads. Each year, participants were given a 5\$ gift card as an acknowledgement of their contribution. In the current study, we rely on measures of NSB and sociodemographic variables obtained at T1, and on measures of persistence intentions and grades obtained at T2.

Measures

Perceptions of parental need supportive behaviors (T1). Adolescents' perceptions of their mother's and father's *autonomy support* was assessed with the Perceived Parental Autonomy Support Scale (P-PASS; Mageau, Ranger, Joussemet, Koestner, Moreau, & Forest, 2015). Students were asked to indicate the extent to which they agreed with 12 items (e.g., When my father/mother asks me to do something, he/she explains why he/she wants me to do it; $\alpha = .92$ and $.93$ for mothers and fathers, respectively) using a 7-point Likert scale ranging from 1 (do not agree at all) to 7 (very strongly agree). Perceived *involvement* from mothers and fathers was assessed with the Children's Report on Parent Behavior Inventory (CRPBI; Schludermann & Schludermann, 1988). This 10-item scale asks adolescents to indicate the extent to which each item (e.g., In general, my mother/father gives me a lot of care and attention; $\alpha = .91$ and $.93$ for mothers and fathers) represents their mother and father using a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree). Parental structure was assessed with the Multidimensional Parental Structure Scale (MPSS; Ratelle et al., 2017). Adolescents indicated whether each of the 24 items (e.g., My mother/father tells me when I don't respect a family rule; $\alpha = .86$ and $.87$ for mothers and fathers) reflected their relationship with their mother and father using a 5-point Likert scale that ranged from 1 (never or almost never) to 5 (always or almost always).

Self-reported parental need supportive behaviors (T1). Mothers and fathers also reported on their respective NSB toward the target youth. Autonomy support and involvement were assessed with the parent version of the P-PASS and demonstrated acceptable psychometric qualities (Mageau et al., 2014; Ratelle et al., 2017). It includes 13 items that assess autonomy support (e.g., When I try to help my child to do something that is difficult for him/her, I make an effort to see things from his/her perspective; $\alpha = .87$ and $.89$ for mothers and fathers) as well as 4 items similar to those of the CRPBI for involvement (e.g., I'm sincerely interested by what my child does and to know how he/she is doing; $\alpha = .82$ and $.89$ for mothers and fathers). Mothers and fathers indicated, on a 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree), the extent to which each statement applied to them. The parent version of the MPSS was used to assess maternal and paternal *structure*. As for the adolescent version, parents were asked to indicate the extent to which each of the 24 items represented their relationship with their child (e.g., My child knows what are my expectations regarding school; $\alpha = .85$ and $.86$ for mothers and fathers). A 6-point Likert scale ranging from 1 (not at all like me) to 6 (completely like me) was used.

Grades (T2). Students were asked to report their grades for Math and French. Grades were indicated on a 0-100 scale, as typical of official school grades in the Quebec school system.

Persistence intentions (T2). Adolescents' intentions to persist in school were assessed with a measure of future schooling intentions (Vallerand et al., 1997; Gillet, Morin, & Reeve, 2017). It included two items (I often consider dropping out of school; I intend to drop out of school; $r = .59$) assessed on a 7-point scale ranging from 1 (not at all in agreement) to 7 (completely in agreement).

Sociodemographic variables. Students reported on their age, gender, type of school (private or public), whether they repeated a grade, place of birth, and maternal language. Parents

also indicated their age, place of birth, and maternal language, as well as their education level, family income, marital status, and number of children.

Statistical Analyses

Model testing. The proposed models were tested with structural equation modeling using Mplus (version 7.11; Muthén & Muthén, 2008-2012). These models were estimated using a robust maximum likelihood estimator (MLR) in addition to the Mplus design-based correction of standard errors (Asparouhov, 2005), providing standard errors and fit indices that are robust to the Likert nature of the items, to non-normality, and to the nonindependence of the data for adolescents and parents. The adequacy of model fit was estimated with the comparative fit index (CFI; Bentler, 1990), the Tucker-Lewis index (TLI; also known as the Bentler-Bonett non-normed fit index; Bentler & Bonett, 1980), and the root mean squared error of approximation (RMSEA). Values greater than .90 and .95 for the CFI and TLI are respectively considered to indicate adequate and excellent fit to the data, whereas values smaller than .08 or .06 for the RMSEA respectively support acceptable and excellent model fit (e.g., Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005).

MTMM analyses. As noted above the nature of the present study design made it impossible to combine the two parents into a single model. For this reason, MTMM analyses were conducted separately for mothers and fathers. For both parents, a model including ratings of mother or father autonomy support, involvement, and structure as evaluated by the target parent and the adolescent, as well students' school grades and persistence intentions was estimated. Items assessing NSB were allowed to load on both one source and one construct factors (e.g., the item *cmsa1*, which assessed adolescents' perceptions of maternal autonomy support, loaded on the factor representing youth's perceptions of maternal behaviors as well as on the factor representing autonomy support). Thus, each model included seven latent factors: adolescents' evaluation of NSB, parental self-reported NSB, autonomy support, involvement, structure, grades, and persistence intentions (see Figure 1). Factors representing the sources of evaluation (i.e., parent and youth; left part of the model) were allowed to correlate with one another, while factors representing the specific NSB (i.e., autonomy support, involvement, and structure; right part of the model) were also allowed to correlate with one another. However, sources factors were not allowed to correlate with NSB factors. Grades and persistence intentions were specified as predicted by both the sources and NSB factors. All factors were scaled using a non-arbitrary method (Little, Slegers, & Cars, 2006). This method more accurately preserves the natural metric of the indicators (see Little et al., 2006; Scalas, Marsh, Morin, & Nagengast, 2014). An a priori correlated uniqueness was also incorporated to control for the wording effect related to the use of one identical item in the parental and adolescent questionnaires.

Missing data. As it is typically the case with longitudinal research, there are some missing data across data waves. In the case of mother-child dyads, 75% of them provided T2 data while, for father-child dyads, it was 65%. A robust full information maximum likelihood procedure was therefore used to estimate model parameters while taking missing data into account (Enders, 2010; Graham, 2009).

Interpretation of results. Following recommendations from Wilkinson and the APA Task Force on Statistical Inference (1999), and aligned with what has been labeled the *statistics reform* (Kline, 2013) or *new statistics* (Cumming, 2012), parameter estimates from the predictive analyses are interpreted using effect size estimates rather than the results of null hypothesis significance testing (i.e., *p* values). We thus focus our interpretation on effect sizes that can be considered to be at least small in magnitude (e.g., $r = .10$ or $R^2 = .01$), regardless of their *p*-values.

Results

Preliminary Analyses

Gender differences were examined and differences were found for maternal reports (Wilk's λ [37,361] = .84, $p < .01$). Specifically, mothers reported higher levels of involvement and structure when the target adolescent was a girl (1% and 2% explained variance for structure and involvement, respectively). When examining confidence intervals for these differences, maternal involvement was the only measure on which an actual difference was observed (i.e., no overlap between confidence intervals for girls and boys).

Before testing the proposed model for maternal and paternal behaviors, we created shorter versions for measures of parental behaviors to reduce the model's complexity while preserving the construct validity and definition for each latent variable. These analyses are reported in the online supplements. For each NSB, the reduced scales each included three items per factor. These scales were used to test the multitrait-multimethod (MTMM) model proposed in Figure 1 and described earlier.

Multitrait-Multimethod Analyses

Mother-youth MTMM model. The model assessing maternal NSB did not result in an adequate level of fit to the data (χ^2 [198] = 766.38, $p < .01$; CFI = .79, TLI = .73; RMSEA = .08, CI [.07, .08]). Essentially, the problem lies in the poor concordance between mothers' and adolescents' ratings of each type of behavior, suggesting that our a priori decision to define factors reflecting what both sources shared in terms of specific NSB ratings was not appropriate in this context. This lack of convergence between mothers and adolescents was illustrated by two findings: 1) the weak factor loadings for maternal scores on each behavior factor, and 2) a relatively low factor correlation between the source factors ($r = .26$), suggesting at best a moderate level of convergence.¹

Father-youth MTMM model. The model assessing paternal NSB similarly resulted in a poor level of fit to the data (χ^2 [199] = 546.87, $p < .01$; CFI = .83, TLI = .79; RMSEA = .08, CI [.07, .09]), which can also be explained by a lack of convergence between fathers' and adolescents' ratings of paternal NSB ($r = .12$).

CT-C(M-1) models. Because of the convergence problems described above, CT-C(M-1) models were estimated where one of the source factors in the MTMM model was removed. Hence, the "trait" factors representing the ratings of each specific NSB that are shared by both sources (parent and youth), while the remaining source factor directly reflects what is unique to parental ratings relative to adolescents' ratings. However, the lack of convergence in parents' and adolescents' ratings still resulted in models providing a suboptimal level of fit to the data for both the mother-youth (χ^2 [284] = 867.94, $p < .01$; CFI = .78, TLI = .72; RMSEA = .06, CI [.06, .07]) and father-youth models (χ^2 [284] = 687.58, $p < .01$; CFI = .81, TLI = .76; RMSEA = .07, CI [.06, .07]). In particular, these models resulted in weak factor loadings of the parental ratings on the specific NSB factors (λ s = .00 to .23), which thus appeared to be mainly defined by adolescents' ratings.

Distinguishing Sources of Evaluations of Parental NSB

The results presented so far suggest that neither the MTMM, nor the CT-C(M-1) models are able to provide a satisfactory representation of multi-informant ratings of NSB, due in great

part by the low level of convergence between adolescents' ratings of parental NSB and parents' self-reports of their own NSB. Rather, these findings demonstrate the need to use distinct factors to reflect parental self-reports and adolescents' ratings of parental NSB. Based on this conclusion, we therefore estimated a final set of models in which six correlated factors representing parents' and adolescents' ratings of parental NSB were estimated and allowed to predict grades and persistence intentions. As above, separate models were estimated for maternal and paternal NSB. The results from these models are respectively illustrated in Figures 2 and 3.

Mother-youth model. The mother-youth model yielded satisfactory level of fit to the data ($\chi^2 [180] = 301.97, p < .01$; CFI = .95, TLI = .94; RMSEA = .04, CI [.03, .05]). Correlations among the latent factors included in this model are reported in the top panel of Table 1, and show that mother-youth convergence in ratings of each NSB dimension was small to moderate, as revealed by the magnitude of correlation coefficients, thereby supporting the need to assess them as separate factors. The measurement part of the model indicated that all latent factors were adequately assessed by their indicators ($\lambda_s = .51$ to $.96$). The predictive paths for which the effect size can be considered to reflect at least a small ($\beta \geq .10$) degree of association between constructs are represented in Figure 2. The structural part of the model, for which paths whose strength of association was small ($\beta \geq .10$) or above are reported in Figure 2. They indicated that both achievement outcomes were not predicted by maternal reports of their NSB. However, adolescents' perceptions of their mothers' autonomy supportive behaviors predicted higher grades, while their perceptions of their mothers' structuring behaviors predicted higher intentions to pursue their schooling. For both outcomes, the effect size for each prediction can be considered small and, together, these perceived maternal behaviors explained a small-to-moderate amount of variance (3-4%) in these outcomes.

Father-youth model. The father-youth model also yielded satisfactory level of fit to the data ($\chi^2 [180] = 279.57, p < .01$; CFI = .95, TLI = .93; RMSEA = .05, CI [.03, .05]). Correlations among the latent factors included in this model are reported in the bottom panel of Table 1. As for mothers, these results showed that father-child convergence in ratings of each NSB was generally small. The measurement part of the model again revealed that all latent factors were adequately assessed by their indicators ($\lambda_s = .51$ to $.96$; with the exception of two loadings on the perceived structure factor at $.34$ and $.44$). As for the mother-youth model, Figure 3 presents paths for which the effect size can be considered to reflect at least a small ($\beta \geq .10$) degree of association between construct. Results indicated that children's ratings of all three NSB predicted higher grades and stronger persistence intentions. Surprisingly, however, adolescents' perceptions of their father's involvement predicted lower grades and persistence intentions, a finding that will be discussed in more details in the next section. In contrast, fathers' reports of their own involvement positively predicted grades, while their reports of their own structuring behaviors positively predicted persistence intentions. The amount of variance in achievement outcomes explained by both sources of evaluation was moderate for grades ($R^2 = .06$) and large for persistence intentions ($R^2 = .24$).

Discussion

The goal of this one-year prospective study was to predict youths' achievement outcomes (i.e., academic achievement and persistence intentions) using parental NSB and determine if it was more important to consider the source of evaluation of these behaviors (adolescents or their parents) or the specific NSB being evaluated, regardless of the source of evaluation. Using data from parent-adolescent dyads, MTMM and CT-C(M-1) models, which would have allowed us to isolate the variance specific to the sources of evaluation from the variance specific to the NSB

themselves, did not result a satisfactory representation of the data, as shown by suboptimal goodness-of-fit indices. This was mostly due to the fact that parents' self-reports and adolescents' perceptions for each NSB differed too much from one another to allow ratings from both sources to be combined in factors reflecting each NSB. Subsequent models showed that NSB needed to be assessed separately by sources, and that maternal and paternal NSB had distinct contributions to their children's achievement-related outcomes. These findings are discussed below in terms of their implications for theories, research, and intervention on parenting and achievement in school.

Implications for Theories, Research, and Interventions

A first implication for the present findings pertains to sources of evaluation on parental behaviors. When reporting on parental NSB, previous results showed that the level of agreement between parents and youths tended to vary from moderate to large when evaluating autonomy support (e.g., Brenning et al., 2012), involvement (e.g., Rohner et al., 2005), and structure (e.g., Merrilees et al., 2011), although additional results revealed that these ratings were weakly related or unrelated with one another (e.g., Grolnick et al., 1991; Logsdon et al., 2013; Ratelle et al., 2017; Sessa et al., 2001). Because each informant can have a unique contribution to the prediction of important student outcomes (Ratelle et al., 2017), it was important to examine whether their combined evaluations of specific NSB was more predictive of achievement-related outcomes than the source of evaluation itself. The fact that parental self-reports and adolescents' perceptions could not be combined in the same factors indicate that each perspective needs to be considered as providing a unique insight into the parent-youth relationship. In fact, it was argued in the psychometric literature that each informant brings a piece of the puzzle that reflects the meaningful variations in the expression of behaviors across situations, as witnessed by each unique informant (De Los Reyes et al., 2013). Instead of choosing between parents and adolescents, research on parent-child relationships would benefit most from adopting a multi-informant methodology, considering the unique contribution each perspective has on important academic outcomes. The methodological and economic costs associated with the addition of informants seem to be profitable in terms of improved prediction and enriched understanding. Furthermore, using MTMM and CT-C(M-1) approaches in dealing with multi-informant data allowed us to confirm the distinct nature of the reports provided by parents and adolescents. We believe this series of models (MTMM, CT-C(M-1), separate factors) should be used as a routine part of any investigation adopting a multiple informant methodology.

Second, our findings also highlighted parent-specific contributions of NSB. As mentioned above, mothers and fathers appear to play unique roles in promoting students' educational achievement-related outcomes (Bogenschneider & Pallock, 2008; Collins & Russell, 1991). While mothers' contribution to achievement outcomes occurred mainly through their child's perceptions, fathers' contribution was evidenced from both perspectives. Hence, when students perceived their father as autonomy supportive, and structuring, their achievement and persistence intentions were higher a year later. With respect to paternal involvement, the results unexpectedly revealed that students' perceptions of paternal involvement predicted lower grades and persistence intentions a year later. An interesting interpretation for this finding is that fathers may become more involved with their child's academic life when they experience academic difficulties. Obviously, statistical suppression might be at play (as suggested by the .70 correlation between students' perceptions of their father's involvement and autonomy supportive behaviors). Still, even statistical suppression may reveal the presence of meaningful mechanisms. Interestingly, despite a similarly strong correlation ($r = .60$) observed for mothers, no similarly negative relation was observed between

maternal involvement and grades, suggesting that something specific to fathers might be revealed through these results. When we consider more specifically the nature of the multiple regression model, where the effect of each predictor is assessed net of what it shared with the others, this result also suggests that it is the presence of an unbalanced level of father involvement, not accompanied by matching levels of autonomy support and structure, that carries a risk in terms of achievement-related outcomes. Obviously, these two interpretations (achievement problems leading to greater involvement, or the need to balance NSB) would need to be examined more thoroughly in future research relying on a longitudinal design allowing for a more complete disaggregation of the directionality of the observed associations. Still, it is important to note that this unexpected result was limited to youths' perceptions of paternal involvement. When fathers' ratings of their own NSB are considered, involvement shared a positive relation with academic achievement, while their levels of structure shared a positive relation with persistence intentions. As discussed earlier, fathers might refer to a different sample of situations than adolescents do when reporting on their parental behaviors, which can explain the uniqueness of each perspective.

Surprisingly, maternal ratings of their own NSB shared no relation with academic achievement or persistence intentions, and even adolescents' perceptions of parental NSB suggest a stronger contribution from fathers in predicting achievement-related outcomes than from mothers. The research literature generally depicts father-child interactions as more oriented toward achievement and mastery than mother-child interactions, themselves characterized by stronger closeness and disclosure (Collins & Russell, 1991). While both parents have been found to be equally involved in their children's academic activities (see Lamb & Lewis, 2005), previous research has also supported the positive contribution of fathers to youths' levels of academic achievement (e.g., Chen, Liu, & Li, 2000; Lewis, Newson, & Newson, 1982). Arguably, our findings might have been different if emotional outcomes had been considered. In general, parenting research shows that mothers' and fathers' contribution to youths' social, emotional, and cognitive development was cumulative and that each parent had a unique contribution to specific developmental facets (see Lamb & Lewis, 2005; Parke, 2000). Future research would benefit from comparing, in a same model, maternal and paternal contributions to youths' development, something that was not possible in the present study. Such a model would control for shared effects of both parents by having mothers, fathers, and adolescents report on maternal and paternal NSB.

As noted in the previous paragraph, a surprising finding was that youths' perceptions of their mother predicted few achievement-related outcomes. It is especially counterintuitive given that previous findings obtained with similar multi-informant design supported the contribution of youths' perceptions of their mothers' NSB for academic adjustment (Ratelle et al., 2017). One explanation for this finding might be that maternal self-reports were more error-prone than paternal ones. This possibility could be tested by adding observers as another source of information on parental NSB, although findings highlight the poor correspondence between observers' ratings of NSB and both maternal self-reports and youth's perceptions (Chen, Pomerantz, Wang, & Qu, 2016) suggest that other mechanisms might be at play.

Finally, the current findings also suggest that there might be benefits for school-based interventions aiming to increase academic success to target parents. Knowing that students' grades and intentional persistence can be facilitated by parental NSB, mobilizing parents in supporting their children's psychological need satisfaction appears to be of prime importance. This can be done through by communicating to parents the importance of their involvement in their children's schooling, but the equal importance of balancing this involvement with autonomy support and structure (i.e. avoiding over-involvement) needs to be stressed. A variety of strategies can be put

in place such as inviting parents to attend workshops offered on the school premises, sending information brochures, or offering online training programs on optimal parenting behaviors. In doing so, it is important to make parents aware that their behaviors might not be perceived in the same manner by their children, which the poor parent-youth agreement on NSB herein obtained seems to signal.

Strengths, Limits, and Future Research

Several strengths of the study can be identified, such as its prospective design, the use of a stratified sample of students provided by the Quebec Ministry of Education, having three informants report on NSB, and so on. The significance of these findings must nevertheless be interpreted as a function of the limits of the study. A first limit pertains to the descriptive nature of the research design. Being a non-experimental study, no control could be exerted on independent variables. As a result, the findings cannot be interpreted as demonstrating causal effects. For ethical reasons, it would be unrealistic to subject parental NSB to experimental manipulation in any case. Still, an alternative longitudinal panel design incorporating measures of all variables at both time points would have provided us with a clearer disaggregation of the true underlying directionality of the relations between NSB and achievement-related outcomes. Second, separate models were estimated for mothers and fathers, a decision based on the fact that parents reported on their behaviors but not on those of their coparent, which made it impossible to incorporate both parents in a single model. Future research would need to survey complete triads (mother, father, and adolescents) and have everyone report on each parent's NSB in order to obtain an even more complete picture of the mechanisms at play in these relations. Finally, some might question our use of self-reported grades as a valid indicator of academic performance. It was demonstrated that self-reported and school or teacher reported grades correlated highly (with $r_s > .80$; Kuncel, Credé, & Thomas, 2005), which supports our confidence that we adequately measured school achievement.

Suggestions for future research also include the possibility to include siblings' perspective to increase the number of evaluators of parental NSB. Research showed that parents do not behave in exactly the same way with each child and the fact that they adapt their practices to be sensitive to their children's needs and developmental characteristics can be more equitable and beneficial to the child (Jeannin & Van Leeuwen, 2015; Volling, 1997). Having siblings report on their parents' NSB can therefore increase the richness of information on the contribution of each parent. Another research avenue would be to examine possible moderators of the contribution of parental NSB on youths' academic success (e.g., attending or not a competitive school) as well as the direct contribution of other factors (e.g., learning difficulties) that could explain why parents increase or decrease their NSB. Mediators may also be usefully incorporated to these studies (e.g., psychological need satisfaction, motivations, goals) to more accurately identify the psychological processes explaining parents' contribution to achievement-related outcomes. Finally, we suggest investigating other important outcomes (e.g., emotional functioning). Knowing that mother-child interactions are characterized by warmth and nurturance, other dimensions of students' school functioning might be more strongly predicted by maternal behaviors than by paternal ones.

Conclusion

Studying the parent-child relationship is important for understanding how youths develop and thrive. Encouraging parental behaviors that support youths' psychological needs for

autonomy, competence, and relatedness will contribute to students' ability to achieve in school. Parents therefore need to behave in ways that support the volitional nature of their children (autonomy support), provide them with important material and emotional resources (involvement), and make their home environment more predictable (structure). What we know from the present study is that these behaviors are uniquely perceived by actors (mothers and fathers) and perceivers (youths), signaling the need to design interventions targeting both parents and students.

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Footnote

- ¹ Conclusions held irrespective of whether outcomes were included, or not, to the model.

Table 1

Correlations among Latent Factors for Models with Separate Source Factors

Mother-Child Model								
	1	2	3	4	5	6	7	8
<i>Child Perceptions</i>								
1. Autonomy Support	–							
2. Involvement	.60	–						
3. Structure	.34	.26	–					
<i>Maternal Self-Reports</i>								
4. Autonomy Support	<u>.11</u>	.05	.05	–				
5. Involvement	.27	<u>.20</u>	.11	.39	–			
6. Structure	.04	.06	<u>.18</u>	.40	.40	–		
<i>Achievement Outcomes</i>								
7. Grades	.13	.07	.11	-.01	.06	.07	–	
8. Persistence Intentions	.12	.10	.15	-.02	.06	.07	.41	–
Father-Child Model								
	1	2	3	4	5	6	7	8
<i>Child Perceptions</i>								
1. Autonomy Support	–							
2. Involvement	.70	–						
3. Structure	.48	.41	–					
<i>Paternal Self-Reports</i>								
4. Autonomy Support	<u>.15</u>	.10	-.13	–				
5. Involvement	.22	<u>.18</u>	.09	.54	–			
6. Structure	.08	-.03	<u>.16</u>	.48	.45	–		
<i>Achievement Outcomes</i>								
7. Grades	.08	-.04	.15	.01	.11	.08	–	
8. Persistence Intentions	.40	.20	.40	.01	.12	.17	.49	–

Note. Coefficients in bold represent results with a small effect size ($\beta = .10$) and above. Underlined coefficients represent parent-youth agreement for each behavior.

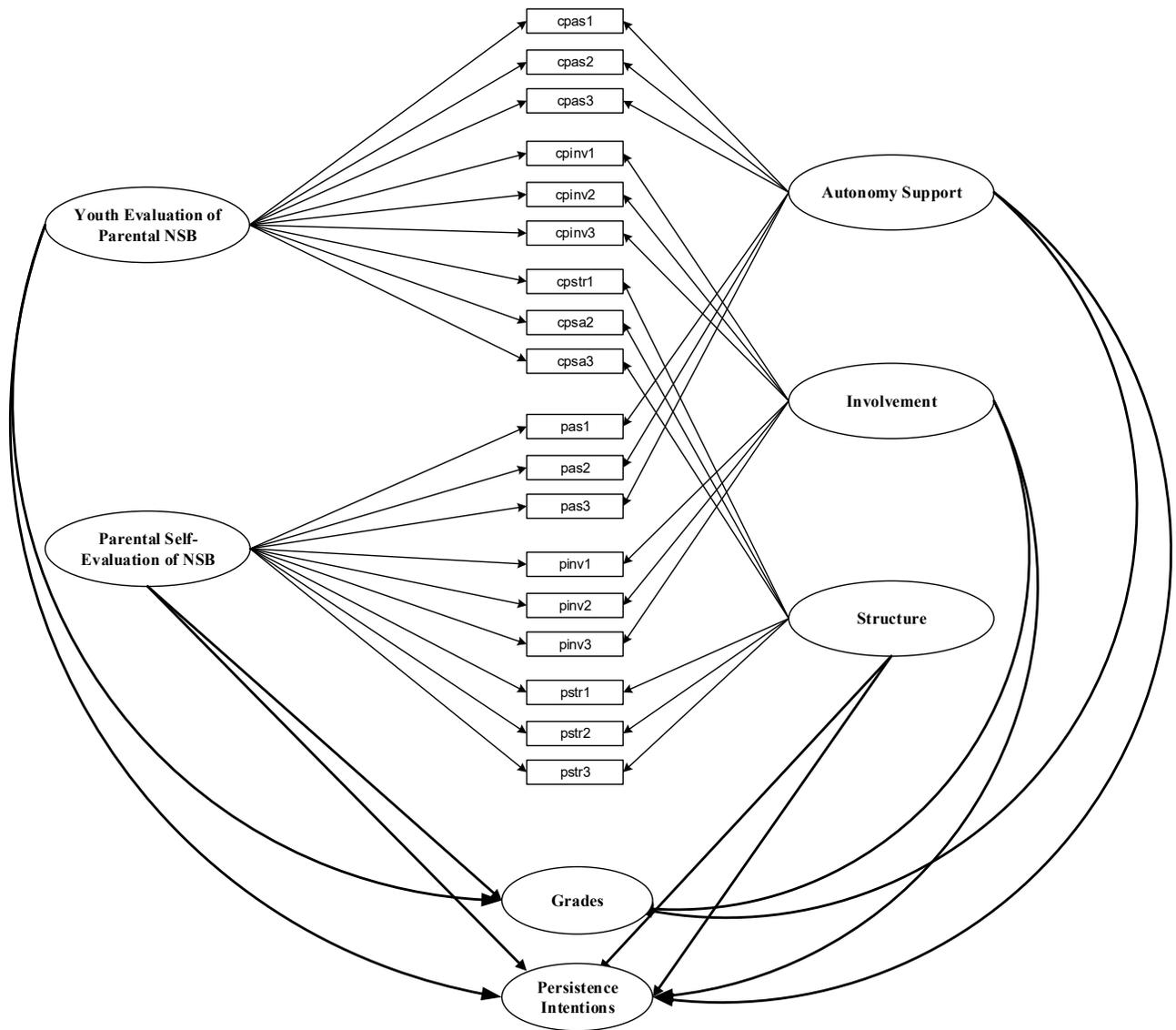


Figure 1. Proposed Model

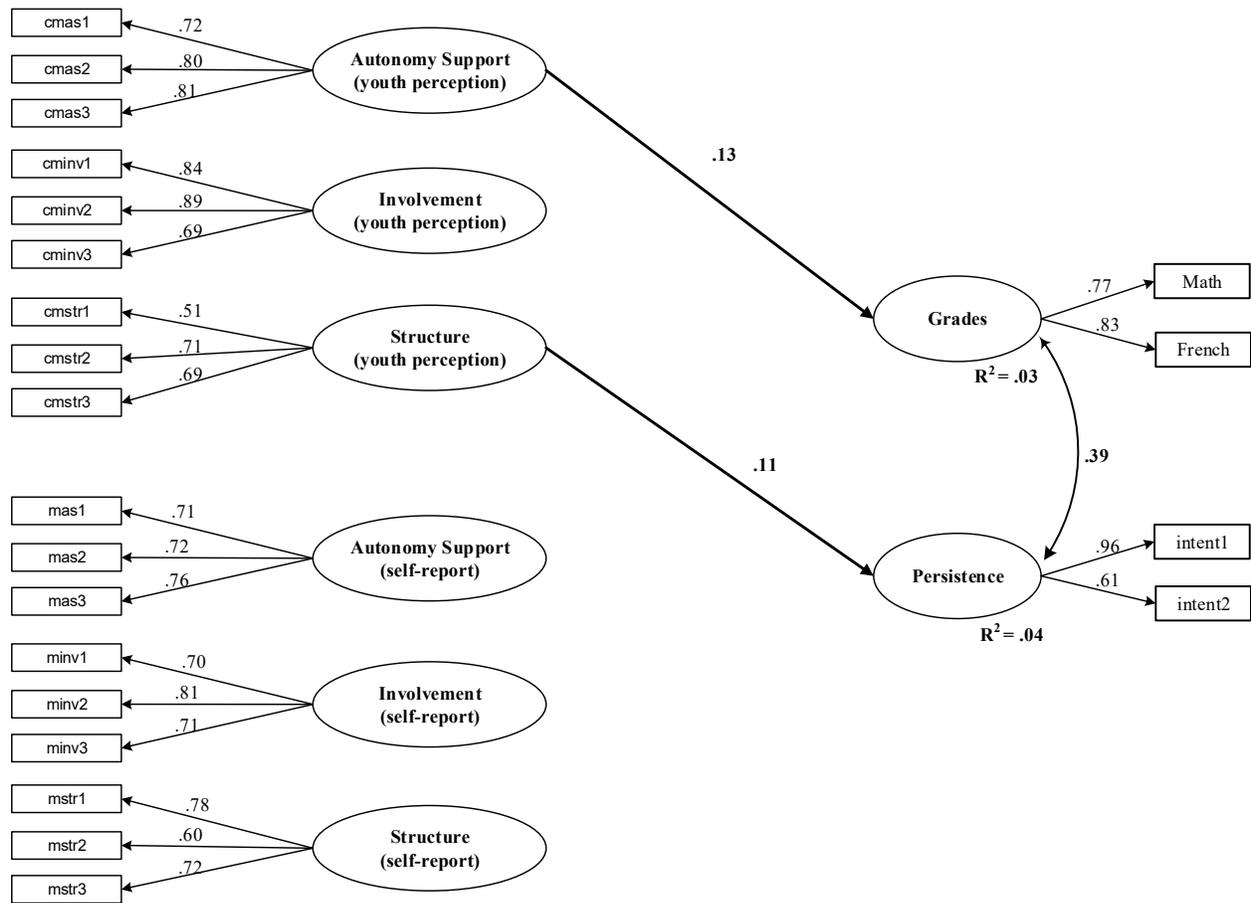


Figure 2. Mother-Youth Model with Separate Factors for Sources of Evaluation ($N = 435$ dyads).

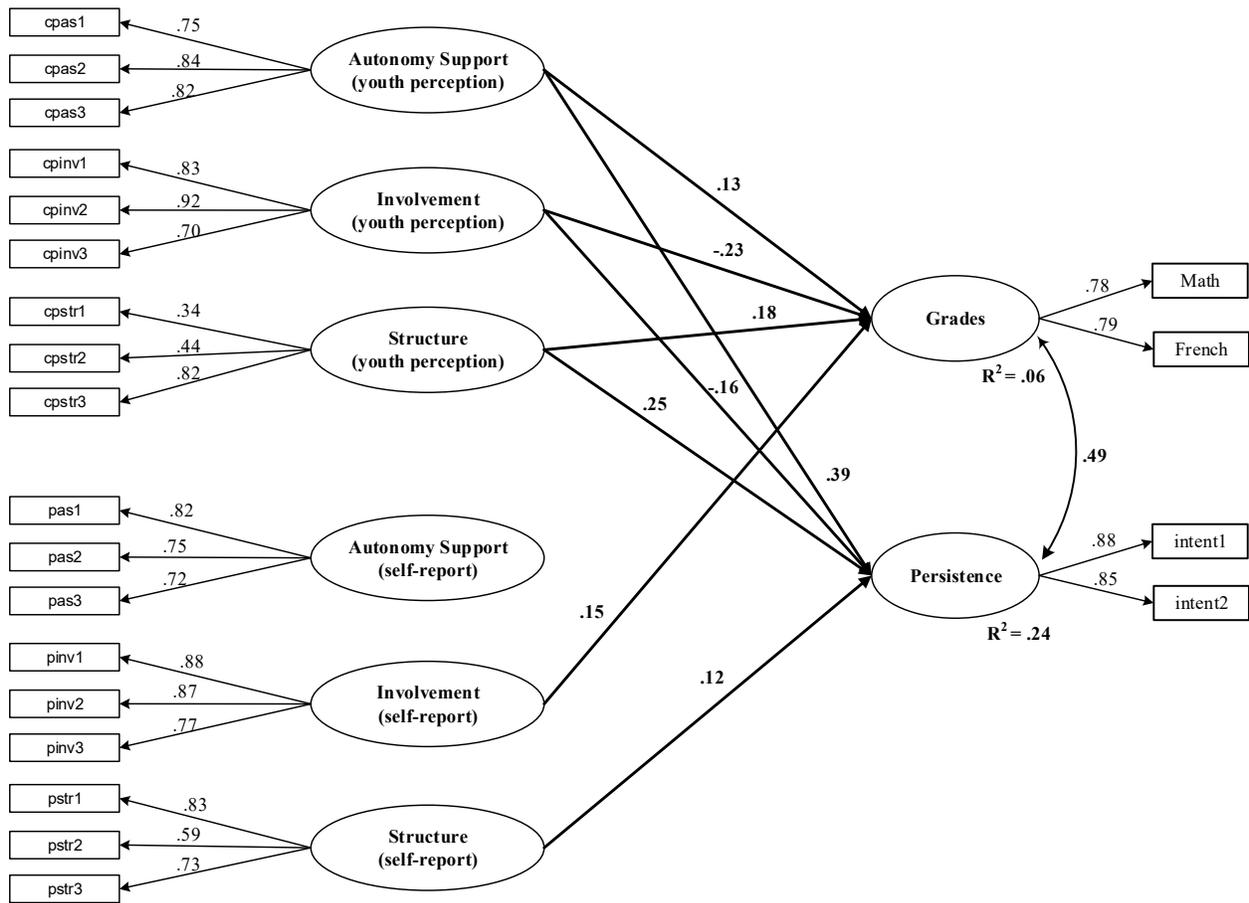


Figure 3. Father-Youth Model with Separate Factors for Sources of Evaluation ($N = 246$ dyads).

Online Supplements for

Source of Evaluation of Parental Behaviors as Predictors of Achievement Outcomes

Scale Reduction Using Exploratory Structural Equation Modeling

While the scales used to assess parental autonomy support, involvement, and structure are strongly grounded in theory and have demonstrated satisfactory psychometric qualities, their length is a shortcoming when testing complex models. Based on previously established guidelines for item selection (e.g., Maiano et al., 2009; Morin, Scalas, Vispoel, Marsh, & Wen, 2016), we estimated exploratory structural equation models (ESEM) to identify, for each parental behavior, the best items for each factor. In the current study, our objective was to identify three items per factor that load strongly on their target factor and not, or barely, on the other two factors. ESEM is well-suited to the analysis of multidimensional measures of conceptually related constructs, such as the current measures of parental behaviors, as it provides a way to take into account the possibility for the items to simultaneously reflect more than one factor (Morin, Arens, & Marsh, 2016; Morin, Marsh, & Nagengast, 2013). ESEM freely estimates cross-loadings between items and non-target factors while targeting these cross-loadings to be as close to zero as possible when used with a confirmatory target rotation procedure. This free estimation of cross-loadings has been shown to result in unbiased estimates of factor correlations even when no cross-loadings are present in the population model (Asparouhov, Muthén & Morin, 2015), and is particularly well-suited to a scale reduction process as it simultaneously estimates all cross-loadings, allowing for the identification of potentially problematic items in a single step (Morin & Maïano, 2011).

Adolescents' Perceptions

Perceptions of maternal behaviors. A first ESEM model was estimated using items assessing adolescent's perceptions of their mother's autonomy support, involvement, and structure. The items with the strongest target loadings and the lowest cross-loadings were retained and a second ESEM model was estimated. This second model yielded satisfactory indices of model fit ($\chi^2 [12] = 6.55, p = .89; CFI = 1.00, TLI = 1.02; RMSEA = .00, CI [.00, .02]$). Factor loadings are presented in Table S1. Correlations between latent factors indicate that maternal behaviors were positively correlated but not redundant. Maternal autonomy support was positively correlated with maternal involvement ($r = .41$) and structure ($r = .41$), with these two factors being also positively and weakly correlated ($r = .11$).

Table S1*ESEM Factor Loadings for Items Assessing Youth's Perceptions of Maternal Behaviors*

	Maternal Autonomy Support	Maternal Involvement	Maternal Structure
Autonomy Support Items			
cmas1	.72	.09	-.09
cmas2	.75	.08	.13
cmas3	.72	.12	.06
Involvement Items			
cminv1	.14	.75	-.00
cminv2	.02	.92	-.1
cminv3	.20	.56	.08
Structure Items			
cmstr1	-.00	-.04	.53
cmstr2	-.04	-.02	.87
cmstr3	.21	.15	.52

Note. Coefficients in bold indicate the factors on which the items were targeted to load.

Perceptions of paternal behaviors. The same final set of items was retained to assess adolescents' perceptions of their fathers, and also resulted in a satisfactory solution in terms of model fit ($\chi^2 [12] = 11.99, p = .45$; CFI = 1.00, TLI = 1.00; RMSEA = .00, CI [.00, .07]). Factor loadings are presented in Table S2. Similar correlations were obtained among latent factors for perceived paternal behaviors. Specifically, paternal autonomy support was positively correlated with both involvement and structure ($r_s = .48$ and $.17$, respectively), which were also positively correlated with each other ($r = .14$).

Table S2*ESEM Factor Loadings for Items Assessing Youth's Perceptions of Paternal Behaviors*

	Paternal Autonomy Support	Paternal Involvement	Paternal Structure
Autonomy support items			
cpas1	.67	.15	-.03
cpas2	.86	.06	.03
cpas3	.64	.20	.12
Involvement items			
cpinv1	.14	.75	.01
cpinv2	.04	.92	.08
cpinv3	.24	.55	-.01
Structure items			
cpstr1	.12	-.03	.44
cpstr2	-.09	.00	.83
cpstr3	.26	.12	.39

Note. Coefficients in bold indicate the factors on which the items were targeted to load.

Parental Self-Reports

Maternal self-reports. The same procedure was used for selecting items from parental self-reports. The model estimated based on final set of items retained for assessing maternal self-reports of their own behaviors resulted in a satisfactory level of model fit ($\chi^2 [12] = 15.34, p = .22$; CFI = 1.00, TLI = .99; RMSEA = .03 [.00, .06]). Factor loadings are presented in Table S3. The factor representing maternal autonomy support was positively correlated with involvement and structure ($r_s = .22$ and $.23$, respectively), with the latter two factors being also positively correlated ($r = .21$).

Table S3*ESEM Factor Loadings for Items Assessing Self-Reported Maternal Behaviors*

	Maternal Autonomy Support	Maternal Involvement	Maternal Structure
Autonomy support items			
mas1	.71	.03	.02
mas2	.70	.06	.03
mas3	.70	.07	.12
Involvement items			
minv1	.05	.68	.04
minv2	.12	.78	-.00
minv3	-.01	.69	.11
Structure items			
mstr1	.07	.14	.58
mstr2	.04	-.08	.80
mstr3	.06	.15	.63

Note. Coefficients in bold indicate the factors on which the items were targeted to load.

Fathers' self-reported behaviors. The same final set of items was retained to assess paternal self-reports of their behaviors, and also resulted in a satisfactory solution in terms of model fit ($\chi^2 [12] = 11.99, p = .45$; CFI = 1.00, TLI = 1.00; RMSEA = .00, CI [.00, .07]). Factor loadings are reported in Table S4. Fathers' autonomy support correlated positively with their involvement and structure ($r = .33$ for both) and their involvement also positively correlated with their structure ($r = .28$).

Table S4*ESEM Factor Loadings for Items Assessing Self-Reported Paternal Behaviors*

	Paternal Autonomy Support	Paternal Involvement	Paternal Structure
Autonomy support items			
pas1	.81	.08	.01
pas2	.67	.08	.10
pas3	.62	.07	.17
Involvement items			
pinv1	.06	.85	.07
pinv2	.09	.80	.09
pinv3	.12	.70	.06
Structure items			
pstr1	.15	.04	.60
pstr2	.04	.04	.68
pstr3	.03	.09	.67

Note. Coefficients in bold indicate the factors on which the items were targeted to load.

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