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Empirical study

Comparing the contribution of overall structure and its specific dimensions for competence-related constructs: A bifactor model☆

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ABSTRACT

Through structure, parents provide information that makes their children's environment predictable, thereby contributing to the satisfaction of their need for competence. More recently, researchers have proposed that within parental structure, it is possible to identify six specific dimensions: clear and consistent rules, guidelines, and expectations; predictability; information feedback; opportunities to meet expectations; rationales for rules and expectations; and authority (Farkas & Grolnick, 2010). Because past studies typically assessed one or two of these dimensions, we do not know how useful adding other dimensions would be for predicting constructs related to competence satisfaction. The goal of this one-year prospective study was therefore to determine if including all dimensions of parental structure would improve the prediction of students' competence-related constructs. The sample included 378 adolescents (53% girls) who completed a survey assessing the six dimensions of parental structure (Time 1) and competence-related constructs (academic achievement and adjustment, vocational efficacy and self-concept; Time 2). Using exploratory structural equation modeling, we tested a bifactorial model of structure, which allowed comparing within a single model the contribution of global structure to that of its underlying dimensions. Results supported the utility of considering all indicators of parental structure, without needing to discriminate among those relating to a specific dimension. Indeed, the global factor was a stronger predictor of constructs, compared to specific dimensions. Implications for research on motivation and parenting are proposed.

1. Introduction

According to self-determination theory (SDT; Ryan & Deci, 2017), all individuals, including children, have innate psychological needs for autonomy (i.e., feeling volitional), competence (i.e., feeling one's behaviors produce desired consequences), and relatedness (i.e., developing deep bonds with significant individuals) whose satisfaction is vital for their development, growth, and adjustment. Children's psychological need satisfaction comes from various sources, an important one being their parents. Their contribution to their children's psychological need satisfaction is enduring and transcends childhood, as revealed by studies with young adults (e.g., Duchesne, Ratelle, Larose, & Guay, 2007; Ratelle, Larose, Guay, & Senécal, 2005). In the self-determination literature, three categories of supportive parental behaviors have been identified (Pomerantz, Kim, & Cheung, 2012; Ryan & Deci, 2017). First is autonomy support, which entails recognizing the child as a unique and volitional individual (see Pomerantz, Grolnick, & Price, 2005). Second is involvement and it refers to parents' allocation of important material and emotional resources to the child (Grolnick & Slowiaczek, 1994; Pomerantz et al., 2012). These two categories of behaviors received the most scrutiny in the parenting literature and extensive research supported their contribution for several positive variables such as psychological need satisfaction, adjustment, well-being, and achievement (Pomerantz et al., 2012; Ratelle, Duchesne, & Guay, 2017; Wilder, 2014). The last parenting behavior, structure, has been less studied and is the object of this study.

1.1. Parental structure

Parental structure refers to behaviors through which parents provide information that makes children's environment predictable and support their self-regulation and competence (Grolnick & Pomerantz, 2009; Grolnick, Deci & Ryan, 1997; Ryan & Deci, 2017). Through structure, parents communicate their expectations and rules, the predictable outcomes of meeting these or not, and guidelines and feedback on their actions. Parental structure is important for children to develop

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mastery and perceived control when interacting with their environment (Ryan & Deci, 2017). Structuring parents promote their children's competent functioning, which is important for their adaptation to different settings, such as school. This important category of need supporting behaviors, while still understudied from a SDT standpoint, has received attention outside its realm. Indeed, parental behaviors aimed at organized children's environment to facilitate their competence has been labeled firm control (Schaefer, 1965), demandingness (Baumrind, 1971; Maccoby & Martin, 1983), strictness-supervision (Lamborn, Mounts, Steinberg, & Dornbusch 1991), or behavioral control (Barber, 1996; see Farkas & Grolnick, 2010; Grolnick & Pomerantz, 2009). These conceptualizations share a focus on the ways parents set up and manage the environment through setting rules, regulations, standards, limits as well as enforcing or monitoring these rules and expectations (also see Skinner, Johnson, & Snyder, 2005). Despite being linked to structure, some of these concepts can be criticized as lacking theoretical background, not being linked to children's needs. This shortcoming can be overcome by using SDT as the underlying framework for understanding children's competent functioning.

Further advancing a self-determination conceptualization of parental structure in the academic context, Farkas and Grolnick (2010) conducted semi-structured interviews with adolescents and asked them and their parents to complete parenting measures. Their results supported a multidimensional conceptualization of parental structure. A first dimension is *clear and consistent rules, guidelines, and expectations* and is observed when parent communicate to their children exactly what they expect of them. Second is *predictability*, which conveys the contingencies between children's behaviors and their outcomes in a way that they always know which consequences ensue their actions. A third dimension is *information feedback*, whereby parents inform their children on their standing regarding family rules and expectations. Fourth are *opportunities* parents provide their child *to meet their expectations*, which can take several forms such as providing children with enough time, making required resources available to them, or offering assistance when needed. A fifth dimension of structure is the *provision of rationales for rules and expectations*, and while it has been included as a dimension of autonomy support in the past, Farkas and Grolnick argue that rationales can be communicated in an autonomy supportive (i.e., conveying importance in a meaningful way) or controlling way (e.g., "because I said so"). Finally, is *authority*, which involves parents taking leadership in family management. It is observed when parents know and monitor what is going on in their children's lives. The composite structure score as well as its underlying dimensions were found to be distinct (i.e., not redundant) from parental autonomy support, control, or involvement (Farkas & Grolnick, 2010).

The goal of multidimensional measures is to underpin a more complete understanding of human behavior, which should allow an optimal prediction of outcomes. While previous evidence suggests that parental structure can benefit a host of academic variables (Pomerantz et al., 2005, 2012), empirical support was obtained using one or few dimensions of structure. Hence, considering parental structure through all its proposed dimensions should theoretically allow a stronger prediction of academic variables. It thus becomes important to evaluate the benefits of a richer conceptualization of structure for improving our prediction of competence-related outcomes in the school context.

1.2. Parental structure and academic variables

From a self-determination perspective, parental structure promotes competent functioning, mostly through the satisfaction of children's psychological need for competence (Farkas & Grolnick, 2010; for reviews, see Pomerantz et al., 2005, 2012). In the education literature, dimensions of parental structure have been related to several constructs, with some, such as rules and authority, receiving most of the attention.

Among the six dimensions of parental structure, all but information feedback were examined with respect to their relations with students' competence-related constructs although these dimensions were not examined in a contrasted way. Specifically, research within and outside SDT found dimensions of authority and rationale to be associated with students' adjustment, academic achievement, motivation, school engagement, learning strategies, educational aspiration, and identity (e.g., Affuso, Bacchini, & Miranda, 2017; Kerr & Stattin, 2000; Kerr, Stattin, & Özdemir, 2012; Lowe & Dotterer, 2013; Malczyk & Lawson, 2017; Mounts, 2001; Padilla-Walker & Nelson, 2012; Top, Liew, & Luo, 2017; Wang, Pomerantz & Chen, 2007). Academic competence, motivation, and achievement were also associated with dimensions of clear and consistent rules, predictability, and opportunities to meet expectations (e.g., Chao & Aque, 2009; Hill & Bush, 2001; Hill, Bush, & Roosa, 2003; Farkas & Grolnick, 2010; Griffith & Grolnick, 2014; Grolnick & Ryan, 1989; Marbell & Grolnick, 2013; Skinner et al., 2005; Wang & Fletcher, 2016). In addition, some studies examined several of the proposed dimensions in an indiscriminate fashion. For instance, Grolnick and her colleagues (Grolnick et al., 2014) used a coding scale for interview data that included items assessing rules, predictability, rationale, and authority (one item per dimension). Their average structure score was associated with students' perceived control in school, their school engagement, and achievement. In a similar vein, the composite score that averaged the six dimensions of structure was associated with school competence, academic engagement and achievement, and perceived control in school (Farkas & Grolnick, 2010). Further, meta-analytic findings suggest a positive, albeit small relationship between structure (labeled behavior control) and achievement (Pinquart, 2016). Hence, students' competence-related constructs positively correlates with many dimensions of structure and the average score.

Despite these encouraging findings, several questions remain to be answered. First, because the reviewed studies often assessed only one or two of six dimensions of structure, we do not know if all dimensions are important for promoting competence-related constructs in general or for a specific outcome (e.g., for academic achievement). Also unknown is whether the prediction of students' competence-related constructs can be improved by adding other dimensions of structure to the equation (i.e., in addition to the frequently used dimensions of authority and rationale). Second, when several dimensions were considered, researchers typically averaged these scores in a composite measure, precluding the comparison of each dimension's contribution. As a result, it is not possible to know about the relative contribution of specific dimensions to students' functioning. In a similar vein, when all dimensions of structure were considered, only correlations between each dimension and academic variables were provided, which do not inform on the relative contribution of these six dimensions. Finally, no research to our knowledge attempted to compare the contribution of overall structure (i.e., a global factor encompassing all dimensions) with its underlying dimensions. Answering such a question has important implications in future research by determining if researchers need to include more neglected dimensions of structure, as well as the necessity to discriminate among dimensions as a function of specific constructs (e.g., achievement could be more strongly predicted by authority). This last element requires the use of a bifactorial model, described in the next section.

1.3. A bifactor model of parental structure

To estimate the contribution of global parental structure to competence-related constructs relative to the contribution of specific dimensions of structure, a bifactorial model is usually the most appropriate. A bifactor model (Gibbons & Hedeker, 1992; Holzinger & Swineford, 1937) is a type of measurement model in which constructs are hierarchically structured, much like a second-order model, but in which the variance of indicators is partitioned into three sources: specific factors, general factor, and error (Kline, 2016). In contrast to the second-order model, the global factor in a bifactor model directly

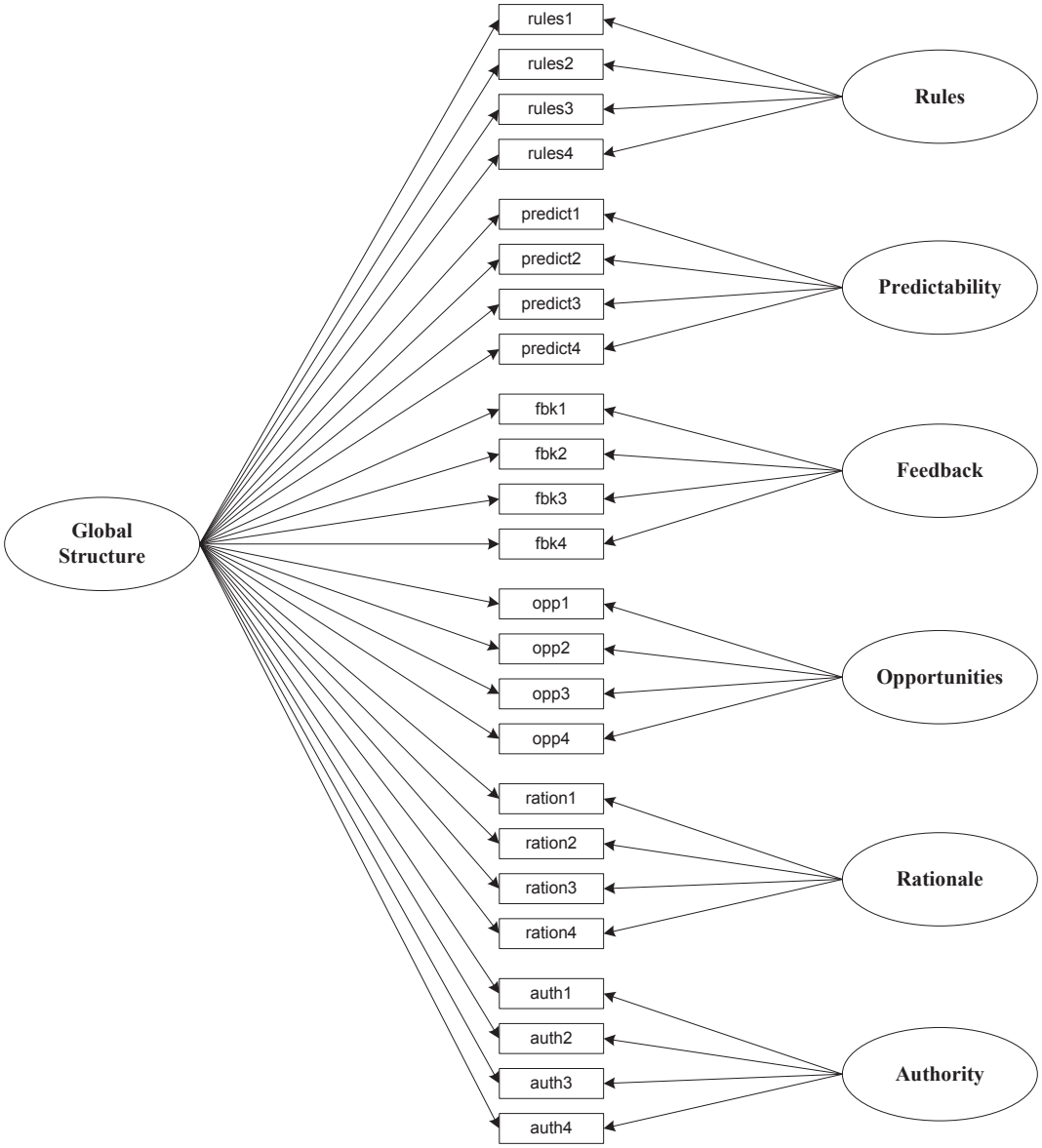

Fig. 1. A bifactor model of parental structure.

affects the observed variables. Hence, within a single model, it estimates variance common to all items (i.e., global factor or g-factor) as well as variance unique to items specific to the dimensions nested within a general factor (i.e., s-factors). Bifactor modeling is achieved by having all items of a multidimensional construct load on the g-factor (left side in Fig. 1) as well as on their respective s-factor (i.e., right side of the model).

Using a bifactor model has important advantages (e.g., better fit for the data, improved interpretive value, more precise estimate of underlying dimensions) over the use of a second-order factor (Chen, West, & Sousa, 2006), one of which being the possibility to discriminate between variance explained by overall structure (g-factor) from that explained by specific dimensions (each of the six s-factors) and contrasting their unique and independent contribution to some variables, in this case competence-related constructs. Indeed, the predictive validity of s-factors, being independent of the g-factor through target rotation (see Morin, Arens, & Marsh, 2016), can be directly estimated within a bifactor model that jointly models a broad construct (i.e., overall structure) as well as more narrow manifestations unique to s-factors (i.e., the six dimensions of structure). Being able to contrast global structure's prediction of competence-related constructs to that of specific dimensions will provide empirical support to the utility of increasing the breadth of the key construct (see Gignac, 2008). If breadth is necessary for optimal prediction of competence-related constructs, the factor defined by a larger number of observations (g-factor) will more strongly predict these variables than factors defined by fewer observed variables (s-factors). This would support the value of increasing questionnaire length to increase the breadth of parental structure measures.

1.4. The present study

The goal of this one-year prospective study was to test if considering all six dimensions of parental structure provided a stronger prediction of students' competence-related constructs than considering only some of its underlying dimensions, as typically found in the literature. Using a bifactor model, the contribution of a g-factor will be compared with that of its underlying dimensions (s-factors: clear and consistent rules, guidelines, and expectations; predictability; information feedback; opportunities to meet expectations; rationales for rules and expectations; and authority) to more adequately test the usefulness of a multidimensional conceptualization of parental structure. Most studies

previously used a cross-sectional design to examine the constructs associated with parental structure. Here, the contribution of parental structure was examined over a 12-month period.

Based on previous research (Farkas & Grolnick, 2010; see Pomerantz et al., 2012) that supported the positive association between parental structure and academic constructs related to mastery and competence, we expected a global structure factor to positively predict scores in competence-related constructs. Four competence-related constructs were examined in this study: academic achievement, academic adjustment (i.e., students' ability to meet the academic demands that relate to their academic work; Baker & Siryk, 1989), self-efficacy (i.e., students' beliefs that they are able to preform tasks in school – in this case activities related to vocational decision-making; Betz, Klein, & Taylor, 1996), and identity (i.e., students' beliefs regarding their goals, interests and talents; Holland, Daiger, & Power, 1980). We expected to replicate previous findings that showed constructs related to competence to be more strongly associated with providing clear rules, guidelines, and expectations, as well as predictability and opportunity to meet expectations. Examining whether a global structure factor explained more variance in competence-related constructs than any specific dimensions was exploratory given that, to our knowledge, no study had attempted to compare the contribution of global and specific factors. Is it possible for what is common to all structure items, represented by a global factor, to have a predominant contribution to competence-related constructs, compared to what is unique to each dimension? Such a question addresses the contrast between holistic and reductionist perspectives found in many research fields. In our context, a holistic perspective posits that multiple indicators of the structure concept are seen as interlinked (i.e., structure items are homogeneous with no specific subparts) whereas a reductionist perspective posits that structure items are organized in functionally distinct components where each is specialized to produce specific constructs. Studies using a bifactorial model of motivation (e.g., Gunnell & Gaudreau, 2015; Howard, Gagné, Morin, & Forest, 2017; Litalien et al., 2017) demonstrated the stronger prediction of the g-factor over s-factors, thereby supporting a holistic perspective. A similar pattern can thus be expected in the present context.

2. Method

2.1. Participants and procedure

Data came from a longitudinal study on parents' contribution to youth's academic and vocational development. The sample included 379 adolescents (177 boys, 202 girls) in their fourth year of secondary school. Participants' mean age was 15 years (SD = .50) and 96% of them spoke French at home. The majority of participants lived with both parents (70%). More than 89% of their mothers earned a high school diploma or more and the average family income ranged from $60 000 CAN to $69 000 CAN, in line with the median household income in Canada at the time of the first data wave ($68 170 CAN; Statistics Canada, 2013).

Participants came from a random sample, provided by the Quebec Ministry of Education, of students who were in Secondary 3 during the 2011–2012 academic year and attended a French-speaking high school. The sample was stratified based on gender, geographic location (rural or urban), type of school (public or private), and socioeconomic status. Participants were surveyed during the fall term. The present research used data from Secondary 4 (Time 1 [T1]; parental behaviors) and Secondary 5 (Time 2 [T2]; competence-related constructs).

2.2. Measures

2.2.1. Parental structure

Mothers' structuring behaviors were assessed using items from the Knowledge of Child's Daily Activities Scale ("Really Know"; Kerr, Stattin, & Trost, 1999; Kerr & Stattin, 2000), the Child Report of Parental Behavior Inventory (CRPBI; Schaefer, 1965; Schludermann & Schludermann, 1988), the Parents as Social Context Questionnaire (PSCQ; Skinner et al., 2005), and the Parenting Context Questionnaire (PCQ; Grolnick & Wellborn, 1988). These measures were found by Farkas and Grolnick (2010) to be most correlated with interview coding for each of the six dimensions of parental structure. With the exception of the Really Know scale, most measures did not include enough items per component to allow psychometric analyses such as calculating reliability coefficients separately for each dimension and to estimate s-factors in a bifactor model. For each s-factor that had fewer than 4 items, additional items were created by a committee of three experts in parenting and SDT, drawing on existing scales for their wording. Because no scale mapped on predictability and information feedback, 4 items were formulated for each. This yielded a total of 24 items (4 items per s-factor). Because reliability estimates require 3 items, having 4 items per dimension allowed to discard an inadequate item, if necessary, and still be able to assess scale reliability. New items were developed in French and the items retrieved from the CRPBI, PCQ, PSCQ and Really Know scales had previously been translated into French using a back translation procedure (see Vallerand, 1989). This multidimensional scale has been successfully used in the past (Ratelle et al., 2017). The 24 items are presented in the Appendix. Participants had to indicate the extent to which each item corresponded to their relationship with their mother, using a 5-point Likert scale that ranged from 1 (never or almost never) to 5 (always or almost always). Estimates of composite reliability calculated using McDonald's (1970) omega (ω) coefficient were satisfying (ω = .77–.88), with the exception of the rationale factor (i.e., all items from the Really Know), which was lower (ω = .59; see Appendix).

2.2.2. Competence-related constructs

Adolescents' *academic adjustment* was assessed using a French version (Larose, Soucy, Bernier, & Roy, 1996) of the Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1989), adapted to the high school setting (see Ratelle & Duchesne, 2014). The academic subscale of the SACQ assesses the way students deal with the demands associated with their homework, class work, and exams and includes items such as "I have been keeping up to date with my academic work"; ω = .94). Participants indicated the extent to which each of the seven items applied to them, using a 9-point scale ranging from 1 (does not apply to me at all) to 9 (applies to me very well). *Academic achievement* was assessed using students' self-reported grades in Math and French using a 0–100 scale, as typical of official school grades in the Quebec school system. *Self-efficacy* was measured with the Career Decision-Making Self-Efficacy Scale (Betz et al., 1996) translated into French (Guay, Ratelle, Senécal, Larose, & Deschênes, 2006). Adolescents indicated how confident they perceived themselves to be in performing 25 activities pertaining to vocational decision-making (e.g., "Determine the steps to follow if I have academic difficulties with an aspect of my program"; ω = .90) using a 5-point scale ranging from 1 (no confidence) to 5 (absolute confidence). Students' *identity* was assessed with the Vocational Identity Scale (Holland et al., 1980). It included nine items (e.g., "I don't know what my major strengths and weaknesses are"; recoded; ω = .92) scored on a 5-point scale ranging from 1 (doesn't apply to me) to 5 (completely applies to me).

2.2.3. Sociodemographic variables

Students reported on their age, gender, type of school (private or public), whether they repeated a grade, place of birth, and language spoken at home.

2.3. Statistical analyses

2.3.1. Model testing

The proposed bifactor model was tested with structural equation

modeling using Mplus (version 7.11; Muthén & Muthén, –2008, 2012). The model was estimated under 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 and to non-normality. Factor structure was assessed with Exploratory Structural Modeling (ESEM). ESEM was shown to be a better analytical strategy for testing the factorial structure of a multidimensional construct (see Morin, Marsh, & Nagengast, 2013). Whereas traditional confirmatory factor analysis (CFA) assumes that items load on only one factor and that cross-loadings are zero, ESEM allows items to freely load on multiple factors. In line with Gunnell and Gaudreau (2015), we estimated a bi-factorial model where items were allowed to load on specific factors representing each of the six underlying dimensions (six s-factors) of structure as well as on a g-factor representing global structure. We also used a target rotation to reflect the conceptual relations of targeted items with their respective factor (e.g., the loadings of items assessing the rules dimension of structure were targeted to be. 50 on the factor representing rules and .00 on remaining factors; see Gunnell & Gaudreau). Correlations among s-factors and between g-factor and each s-factor were constrained to zero to allow model identification (see Kline, 2016) and to isolate the independent contribution of general and specific factors to predicting competence-related constructs.

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 for the CFI and TLI are respectively considered to indicate adequate fit to the data, whereas values smaller than .08 for the RMSEA respectively support acceptable model fit (e.g., Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005).

2.3.2. Missing data

As it is typically the case with longitudinal research, there are some missing data across data waves. A robust full information maximum likelihood procedure was therefore used to estimate model parameters while taking missing data into account (Enders, 2010; Graham, 2012). In line with Tagliabue and Donato (2015), who showed that missingness can be examined at item, respondent, and family levels, we examined the correlations between missingness and auxiliary variables in our data set. Results suggested that, while the pattern of missing data was not MCAR, it could be assumed to be MAR. More specifically, 15% of the sample (N = 57) missed 1 or 2 items on the structure scale. Item-level missingness was examined as a function of variables in the data set and, while no associations were found with variables such as participants' gender, age, socioeconomic status or number of siblings, a small correlation was found with mothers' age. Hence, participants with older mothers tended to have fewer missing items on the structure scale at T1 ($r = -.10$). In terms of person-level missingness (i.e., not completing the T2 measures), failing to participate was associated with having a younger mother ($r = -.11$) and children being older ($r = .12$).

2.3.3. 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, 2016) 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 p-values.

3. Results

3.1. Preliminary analyses

Gender differences were then examined, where boys and girls were found to differ across variables of the study (Wilk's λ [6,254] = 7.47, $p < .01$). Univariate tests revealed that, in comparison to boys, girls reported higher scores on measures of academic adjustment (M = 6.66 vs. 6.06; $\eta^2 = .04$) and achievement in French (M = 80.41 vs. 74.08; $\eta^2 = .10$) at T2. Importantly, boys and girls reported similar levels of maternal structure, both for the global score and underlying dimensions. Correlations between gender and structure (global score and dimensions) were all trivial in terms of effect size (*r*s < .10).

Before testing the prediction model, measurement models were estimated to ensure that each s-factor was adequately assessed (Model 1) and that items represented a g-factor as well (Model 2). Model 1a tested the postulated ESEM that included six latent factors: (1) Clear and consistent rules, guidelines, and expectations, (2) Predictability, (3) Information feedback, (4) Opportunities to meet expectations, (5) Rationales for rules and expectations, and (6) Authority. Latent factors were scales by fixing one factor loading to 1.0 per factor. Fit indices for the model were acceptable (see Table 1), suggesting that the measurement model adequately fitted the data. Further, this model was superior to a CFA model (Model 1b), which was expected given that the six factors are dimensions of a multidimensional factor. Generally, items loaded more strongly on their targeted factor and cross-loadings were low and weaker than loadings on targeted dimensions. Six items (Rules4, Predict2, Fbk2, Ration2, Ration3, and Auth4) were lower than expected on their target factors (λs < .30). They were thus not included in further analyses.

A bifactor ESEM measurement model was then ran (Model 2 in Table 1), which included seven latent factors, the six s-factors and a g-factor, in line with the postulated model of Fig. 1. The results indicated that all items loaded on the g-factor as well as on their targeted factor (see Table 2). Overall, these findings suggest that all items shared a common broader construct, global structure, and that subgroups of items shared specific manifestations of structure as represented by the six s-factors. The correlations among dimensions of maternal structure obtained in Model 1 (ESEM for the 6 dimensions; see Table 3) suggest that the s-factors were not redundant, each assessing a unique component of structure. Factors were all positively correlated with each other, and the magnitude of these relations were at most moderately strong.

3.2. Predicting competence-related constructs

To test the contribution of global structure and its underlying dimensions to competence constructs, an exploratory bifactorial model

Table 1
Fit indices for all models.

Models	χ^2	*df*	*p*	CFI	TLI	RMSEA [CI]
Measurement models						
1. Model 1a: ESEM model with 6 s-factors	252.44	147	< .01	.97	.93	.04 [.03, .05]
2. Model 1b: CFA model with 6 factors	744.28	237	< .01	.87	.85	.08 [.07, .08]
3. Model 2: Bifactor ESEM model	75.44	48	< .01	.99	.96	.04 [.02, .06]
Prediction model						
4. Predicting competence outcomes with g-factor and s-factors	1229.31	698	< .01	.91	.9089	.05 [.04, .05]

Note. CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean squared error of approximation; CI = confidence intervals.

Table 2
Factor loadings from the bifactor ESEM model for maternal structure.

Item Labels	S-Factors						G-Factor
	Rules	Predictability	Feedback	Opportunities	Rationale	Authority	Structure
1. Rules1	**.43***	-.01	.01	.17*	-.02	-.01	**.62***
2. Rules2	**.37***	.05	.01	.03	.03	-.04	**.53***
3. Rules3	**.65***	.07	.05	.03	-.02	.00	**.67***
4. Predict1	.07	**.49***	-.10	-.16	-.16*	-.10	**.48***
5. Predict3	.14*	**.80***	-.03	-.02	.08	.02	**.42***
6. Predict4	.05	**.42***	.17	-.01	-.19*	.03	**.46***
7. Fbk1	.00	.00	**.42***	-.14	-.22*	-.24*	**.63***
8. Fbk3	.02	.03	**.55***	.13	.01	.01	**.58***
9. Fbk4	.06	.01	**.43***	.25*	.14	.21*	**.46***
10. Opp1	.06	-.04	.08	**.52***	-.07	.05	**.58***
11. Opp2	.05	-.07	-.01	**.58***	.04	.00	**.63***
12. Opp3	.01	-.09*	.06	**.52***	.03	.07*	**.67***
13. Opp4	.12	-.01	.11	**.45***	-.02	-.03	**.56***
14. Ration1	-.05	-.10	-.03	-.01	**.76***	-.01	.29*
15. Ration4	.04	-.17*	-.03	-.01	**.38***	-.15*	**.33***
16. Auth1	.02	.02	.13*	.02	-.03	**.68***	**.51***
17. Auth2	-.01	-.06	-.05	-.03	-.04	**.70***	**.40***
18. Auth3	-.05	-.01	-.10	.11	-.09	.28*	**.58***

Note. Coefficients that are notable (≥.30) are in bold.
*p < .05.

Table 3
Correlations among latent factors from the ESEM solution (N = 378).

	1	2	3	4	5	6
1. Clear and consistent rules, guidelines, and expectations	–					
2. Predictability	**.33**	–				
3. Information feedback	**.38**	**.27**	–			
4. Opportunities to meet expectations	**.40**	**.14**	**.40**	–		
5. Rationales for rules and expectations	**.22**	**.17**	**.24**	**.28**	–	
6. Authority	**.16**	.00	**.13**	**.17**	.09	–

Note. Coefficients in bold represent results with a small effect size (β = .10) and above. All coefficients had a p value below .05 except those involving the authority factor.

Table 4
Standardized regression coefficients for competence-related outcomes at T2 as predicted by a bifactorial ESEM for T1 maternal structure.

Maternal structure (T1)	Competence outcomes (T2)			
	Achievement	Adjustment	Self-efficacy	Identity
Dimensions (S-Factors)				
Rules	−.01	.02	**.26***	**.14**
Predictability	**−.18**	**−.12**	**.13**	.03
Feedback	−.04	−.03	**.14**	.00
Opportunities	**−.10**	−.02	.04	.00
Rationale	.02	**.14**	−.05	−.13
Authority	**.12**	**.26***	**.11**	.08
Global (G-Factor)	**.28***	**.40***	**.29***	**.20***
R^2	.14	.26	.20	.08

Note. T1 = Time 1 (secondary 4); T2 = Time 2 (secondary 5). Coefficients in bold represent results with a small effect size (β = .10) and above. Underlined coefficients highlight, for each outcome, the stronger prediction.
* p < .05.

was estimated where T1 structure (g-factor and the six s-factors; exogenous factors) predicted T2 academic achievement, adjustment, self-efficacy, and identity (endogenous factors). The g-factor and s-factors were orthogonal, as specified by a target rotation. As mentioned earlier, the meaningfulness of predictions was estimated by inspections of effect sizes estimates for the contribution of endogenous factors on the endogenous factor (i.e., proportion of explained variance).

Results revealed that the model converged to a satisfying fit and that exogenous factors explained a large portion of the variance in all endogenous factors (see Table 4). Factor loadings on the structure factors were similar to those obtained in the bifactor measurement model and were all above .50 for academic adjustment, achievement, self-efficacy, and identity factors (one exception being for a .26 loading on academic adjustment; removing the item did not change the solution nor the fit indices). Regression coefficients indicated that global structure (g-factor) predicted competence-related outcomes with effect sizes for the contribution of the g-factor being moderate in size. We must be careful, however, to interpret effect sizes as a function of the research context (see Kline, 2016), which in the case of education research typically fall in the range of what Cohen's classification would consider small (e.g., Hattie, 2009; Lipsey et al., 2012). Importantly, the prediction of the g-factor was independent from that of s-factors, some of which also predicted competence constructs, although to a lesser extent. Several observations can be highlighted: First, authority and predictability factors were the s-factor that predicted the most constructs, with three out of four constructs being predicted with a small effect sizes (expect for academic adjustment predicted by authority, for which the effect size was moderate). Second, the contribution of the rules factor was similar in strength to that of the g-factor when predicting efficacy, but not the other constructs. Third, some unexpected findings were obtained where the predictability s-factor predicted lower levels of academic achievement and adjustment, and the opportunities s-factor predicted lower levels of academic achievement. Interpretations for these findings are proposed in the discussion section. Overall, the general pattern is that the g-factor for maternal structure was a stronger predictor of all competence-related constructs, and none of the s-factors systematically outperformed it across all constructs.

To test if global maternal structure would explain more variance in each competence outcome that any of its underlying dimension, we compared the proportion of explained variance for the g-factor and s-factors (overall R^2 coefficients reported in Table 4). Global structure's partial R^2 for academic achievement (.08), adjustment (.16), efficacy (.08), and identity (.04) accounted for respectively 57%, 61%, 41%, and 48% of the model's shared variance for these respective constructs. None of the s-factors' partial R^2 matched that of the g-factor.

4. Discussion

The goal of this one-year prospective study was to test if considering all underlying dimensions of parental structure allowed a better prediction of competence-related constructs than considering only some dimensions, as usually the case in the literature. Using a bifactor model of parental structure also allowed a comparison between global structure (g-factor) and all of its underlying dimensions (s-factors). Results of exploratory bifactorial analyses revealed that global structure explained the largest share of variance in academic achievement, adjustment, self-efficacy, and identity. It was expected that some s-factors would more strongly predict competence-related constructs than others would but the findings did not provide unequivocal support for this hypothesis. Specifically, the rules factor only predicted half of these constructs, while predictability and opportunities factors had a negative contribution, and their role was limited to academic achievement and adjustment. These findings have important implications for research and theory on structure both in the context of parenting and outside this realm.

4.1. Implications for motivation theory and research

A first implication of this study pertains to Farkas and Grolnick's (2010) multidimensional conceptualization of parental structure. While this conceptualization was developed in the context of interview research, the present results demonstrated its adequacy in the context of survey research. They also show that the six underlying dimensions of structure are not redundant, yet they represent a global structure factor. In addition, the findings that competence-related constructs were more strongly predicted by the g-factor suggests that considering one or two dimensions of structure is not sufficient for optimal prediction of constructs associated with students' competence satisfaction. The scientific benefits, in terms of improvement in explained variance, of measuring all dimensions of parental structure is therefore worth the increase in questionnaire length.

Relatedly, a second implication for these findings is the additional support they offer to SDT and its conceptualization of psychological need support. As mentioned in the most recent version of the theory (Ryan & Deci, 2017), parents' provision of structure is vital for children to function competently and regulate their behaviors. Proposed to encompass several specific behaviors, the focus in mainly on a composite of structure. To an extent, our findings concur with this representation of parental structure by suggesting that researchers need not explicitly discriminate among dimensions but simply aggregate dimensions into a global factor score. However, they provide an important clarification by suggesting an increased predictive utility when considering a maximum number of specific manifestations of structure in this composite.

Third, our findings revealed an unexpected negative contribution of predictability for academic adjustment and achievement. Even if these predictions were relatively small in magnitude, it is important to address their meaning, but caution is advised until replication is supplied by other studies. It is important to keep in mind that the negative contribution of predictability cannot be interpreted as the result of a statistical artifact such as statistical suppression (Maassen & Bakker, 2001) because the target rotation in a bifactor model assumes orthogonality of factors. A more plausible explanation for these findings pertains to the content of this dimension of structure. As defined by Farkas and Grolnick (2010), predictability focuses on the consequences of a child's actions and is related to Baumrind's (1971) concept of firm enforcement. Examining items from this subscale, which maps on the contingencies between children's behaviors and their outcomes, it is possible for this aspect of structure to be experienced as more controlling, and possibly generate anxiety and apprehension of deceiving one's parents. Hence, what is unique to specific manifestation of structure could explain the negative, albeit small contribution of predictability for academic adjustment. While no previous survey study attempted to isolate the unique contribution of this dimension of structure, research with interview data found predictability to be unrelated to students' perceived control, effort, and engagement but positively correlated with their achievement (Farkas & Grolnick, 2010). It is important to note, however, that these findings were based on correlations. Another study (Grolnick et al., 2014) considered predictability but aggregated dimensions of structure, which prevents the identification of dimensions' unique contribution. Hence, replication is needed to better understand the competence-related constructs associated with predictability and whether their association is positive, negative, or neutral.

Another possible interpretation involves the fact that consequences can occur when negative behaviors are carried out. Perhaps the negative relation between academic adjustment and predictable consequences can be explained by adolescents' negative behaviors such that adolescents who report predictable consequences from their parents are engaging in more negative behaviors to begin with. A similar reasoning applies to the negative contribution of the opportunities factor when predicting academic achievement. Possibly, lower-achieving students receive more feedback and opportunities from their mother in order to facilitate the development of their competence. Such explanations would nevertheless need to be tested using a cross-lagged panel design. Previous research that used the PSCQ, from which opportunities items were taken, aggregated all items into a single structure score, again preventing the identification of this dimension's unique contribution. Interview data found the opportunities factor to be positively correlated with achievement, but these results were based on correlations as well. This runs counter to the present finding, which is to be interpreted with caution given the small effect size.

Another implication of our findings involves the use of a bifactor model when contrasting the contribution of a global, multidimensional factor and that of its underlying dimensions. In line with previous studies by motivation researchers who used bifactorial models to assess psychological need satisfaction (e.g., Myers, Martin, Ntoumanis, Celimli, & Batholomew, 2014) and motivations (e.g., Gunnell & Gaudreau, 2015), we distinguished the variance of a multidimensional construct and that of its underlying dimensions in predicting motivational constructs. This analytical strategy offers the advantage of distinguishing, within a single model, outcome variance that can be predicted by what is common to all dimensions (g-factor) from what is dimension-specific (s-factors; see Chen et al., 2006; Reise, 2012). Such analyses allow researchers to estimate how useful it is to discriminate underlying dimensions of a multidimensional construct, compared to using a composite factor. In the present case, the fact that the g-factor explained the largest share of variance in competence-related constructs supports the importance of using a global measure of structure that includes all six dimensions to achieve optimal prediction of these constructs. An possible research avenue would be including this bifactor modeling of parental structure in a longitudinal design to evaluate its stability.

Finally, these findings have implications for research on structure performed outside of the parenting context. One important domain that examines the role of structure is research on teachers' contribution to students' motivational and academic development. Studies on teachers' structure that used survey methods typically assessed this category of need supporting behaviors (e.g., Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Lietaert, Roorda, Laevers, Verschueren, & De Fraine, 2015; Vansteenkiste et al., 2012) with measures like the Teacher as Social Context Questionnaire (Belmont, Skinner, Wellborn, & Connell, 1988) and the School Environment Measure (Wang & Eccles, 2013) which include some but not all of the six dimensions proposed by Farkas and Grolnick (2010). Examining the contribution of global teachers' structure to that of specific dimensions will help identify specific dimensions that might be sufficient to predict students' key competence-related constructs. These future studies would also benefit from using a bifactor model.

4.2. Strengths, limits, and future research

The present study is characterized by several strengths such as the use of a prospective design, participants coming from a stratified sample provided by the Ministry of education, the use of a bifactor model, and a strong underlying theoretical framework. Nevertheless, it is important to consider the limits of this research when interpreting its findings. A first limit pertains to the types of interpretation that can ensue from the obtained results. The research design is descriptive is nature, with no control over our independent variables (i.e., components of structure), such that causal interpretations of the findings are inappropriate. We can therefore only assume that structure contributes to academic adjustment, not that it causes these. Second, it appears that two items from the Really Know scale might benefit from being reformulated, as they were found to load on the rationale component at a suboptimal level. This might be explained by the fact that this scale was not developed with the explicit aim of discriminating components of structure. The valence of these items, which are formulated in a negative stance, might also have interacted with participants' scoring of these. Future research is nevertheless needed before discarding these items, which come from an established psychometric instrument that has been widely used in the parenting literature. Third, all of the data was provided by the same informant, namely adolescents. The relations among factors might, as a result, be tainted by shared method variance. Future research should therefore try to include measures of constructs that are not self-reported by children. This suggestion needs to be moderated by the type of constructs being considered. When examining variables that related to students' competence satisfaction, no informant knows better than students themselves how competent they feel. Other constructs such as achievement, however, can be evaluated by other informants (e.g., teachers). Meta-analytic findings nevertheless supported the validity of self-reported grades, which were found to be highly correlated with official school grades (Kuncel, Credé, & Thomas, 2005).

Other suggestions for future research include the need to examine the contribution of parental structure to students' constructs using a longitudinal design. Having multiple data waves would allow to estimate whether parental structure predicts academic adjustment or whether children's difficulties in adjusting to the academic demands calls for parents to increase the amount of structure they provide to their child. Another suggestion would be to study structure along with other parental need-supporting behaviors that promote important constructs in school to test whether there are optimal parenting profiles that more successfully support school success. Finally, complementarity with observational measures is also an avenue worthy of future investigation, as well as considering structure provided by fathers.

5. Conclusion

This research demonstrated that students' constructs related to the satisfaction of their need for competence can be better predicted from parental structure when all six dimensions are assessed. Parental structure was previously found to be important for children's developing competence and self-regulation. The present findings show that prediction is optimized when structure is operationalized through all its underlying dimensions. Future research would therefore benefit from increasing questionnaire length to map on all dimensions of structure to more strongly predict the satisfaction of children's need for competence and its associated consequences. While there is combined contribution of structure components, as revealed by the fact that global structure was a stronger predictor of students' competence-related constructs, it is possible that, at different developmental stages or in different learning contexts, some dimensions will be more important than others in predicting specific elements of students' competent functioning.

Appendix A

Items used to operationalize dimensions of parental structure

Items	Label	Source
Clear and consistent rules, guidelines, and expectations (ω = .80)		
1. My mother's rules and expectations for me are clear.	Rules1	HM
2. I know what my mother expects of me in school.	Rules2	PCQ
3. I know what my mother's rules and expectations are.	Rules3	HM
4. My mother believes in having a lot of rules and sticking with them.	Rules4	CRPBI
Predictability (ω = .75)		
5. When I don't do my best in school, I know how my mother will react.	Predict1	HM
6. When my mother tells me that she's going to do something, I know she will.	Predict2	HM
7. When I get in trouble at school, I know how my mother will react.	Predict3	HM
8. I always know which consequence will follow my bad behavior.	Predict4	HM
Task-focused information feedback (ω = .77)		
9. My mother tells me when I don't respect the family rules.	Fbk1	HM
10. My mother congratulates me when I satisfy her expectations.	Fbk2	HM
11. When I don't follow family guidelines and rules, my mother takes the time to notify me.	Fbk3	HM
12. My mother tells me when I do something that follows the rules and expectations she has toward me.	Fbk4	HM
Opportunities to meet expectations (ω = .88)		
13. When I want to do something, my parents show me how.	Opp1	PSCQ
14. When I want to understand how something works, my parents explain it to me.	Opp2	PSCQ
15. If I ever have a problem, my parents help me to figure out what to do about it.	Opp3	PSCQ
16. My parents show me how to do things for myself.	Opp4	PSCQ
Provision of rationales for rules and expectations (ω = .59)		
17. My mother does not believe she has to explain the reasons why our house rules and guidelines exist. **R**	Ration1	PSCQ
18.Even if I don't always agree with my mother's rules and guidelines, I understand their reasons.	Ration2	HM
19. My mother explains to me the reasons for her expectations toward me.	Ration3	HM

20. When my mother sets rules and expectations, she doesn't explain their reasons. **R**	Ration4	HM
Authority (ω = .80)		
21. My mother usually knows the kind of homework I have to do.	Auth1	RK
22. My mother knows when I have an exam or a homework to hand in.	Auth2	RK
23. My mother knows how I do in school	Auth3	RK
24. Normally, my mother knows where I go and what I do after school.	Auth4	RK

Note. R = reversed coding; PCQ = Parenting Context Questionnaire; PSCQ = Parents as Social Context Questionnaire; CRPBI = Child Report of Parental Behavior Inventory; RK = Really Know; HM = homemade items inspired by these scales (developed in French; see italicized items). Items were translated into English using the back-translation procedure (Vallerand, 1989), and were then reviewed by a native English speaker. ω = composite reliability estimates.

Appendix B. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.cedpsych.2018.05.005.

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