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The role of parental communication in adolescents' motivation to adhere to treatment recommendations for type 1 diabetes

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Abstract

Objective: Grounded in Self-Determination Theory, this study examines the role of parental expectations and communication style (ie, in an autonomy-supportive vs controlling way) in the prediction of adolescent motivation (ie, internalization or defiance) to adhere to self-management for type 1 diabetes.

Methods: Structural Equation Modeling was used in a cross-sectional, multi-informant study of 129 adolescents (*M*age = 14.43; 54.4% girls), 110 mothers, and 98 fathers. Adolescents reported on self-motivation, treatment adherence, and parental expectations and communication styles; parents reported on their own expectations, communication style, and perceptions of adolescent treatment adherence. Medical record review provided HbA1c values.

Results: Across adolescent and parent reports, parental communication of diabetes-specific expectations and an autonomy-supportive style of communicating expectations related positively to adolescents' internalization of diabetes self-management and negatively to defiance against diabetes self-management. In contrast, a controlling parental communication style showed the opposite patterns of associations. Higher adolescent defiance was related to poorer treatment adherence and worse glycemic control.

Conclusions: Parental communication styles related to adolescent motivation, which in turn, related to adolescent treatment adherence and glycemic control. Future longitudinal research can address the long-term impact of both maternal and paternal communication styles on adolescent motivation to adhere to treatment and their subsequent glycemic control.

Keywords

adolescents; motivation; parental communication; type 1 diabetes

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CONFLICT OF INTEREST

We have no relevant conflict of interest to disclose.

1 | INTRODUCTION

Adolescents face various physical and psychosocial developmental tasks such as achieving a sense of identity and autonomy.[1] Youth with type 1 diabetes are additionally challenged to integrate illness into their identity and to adhere to daily self-management tasks.[2,3] Moreover, adolescents naturally assume more independence and primary responsibility for their diabetes self-care, while parental involvement in daily diabetes care decreases. This gradual shift in responsibility throughout adolescence requires that parents and adolescents need to find a balanced and developmentally appropriate level of parental involvement.[4] Although many adolescents successfully manage to balance these developmental and diabetes-related challenges, treatment non-adherence in this age group is common with only 21% of adolescents reaching HbA1c <7.5% as recommended by the American Diabetes Association.[5,6] Additionally, given the fact that ISPAD recently lowered the glycemic target in children and adolescents who have access to comprehensive care to <7%,[7] the percentage of adolescents achieving optimal glycemic control may be even lower in future studies. Therefore, it is crucial for parents and diabetes teams to identify actionable factors impacting treatment adherence during adolescence. One key factor is adolescents' motivation to follow self-management recommendations communicated to them by health care providers and parents. In turn, adolescents' quality of motivation is affected by various sources of influence, including parents' style of communicating expectations regarding diabetes self-care.

To conceptualize adolescents' motivation, this study draws from Self-Determination Theory (SDT[8]), a theory on human motivation, which has received extensive attention in multiple life domains including diabetes health care.[9] Within SDT, different types or qualities of motivation are distinguished based on their degree of ownership or internalization.[10,11] Internalization refers to the process through which adolescents transform externally imposed guidelines (such as those for diabetes treatment) into personally held values.[12] SDT proposes a motivational continuum from a low level (ie, following guidelines out of a sense of pressure and to avoid negative feelings such as guilt) to a higher level of internalization (ie, when guidelines are personally endorsed and followed out of an understanding of why they are important). Higher levels of internalization reflect a greater sense of ownership and self-endorsement of recommendations, with such ownership contributing to long-term persistence of behavior.[8]

However, internalization and ownership of diabetes responsibilities is an ongoing developmental process, and not all adolescents are ready to adhere to the recommendations for diabetes self-management, or feel competent and capable of doing so. Indeed, some adolescents display oppositional defiance against the recommendations. Defiance against diabetes self-management, also referred to as rebellion, is a clinically well-known phenomenon in adolescents with type 1 diabetes.[13] In recent SDT-based research, defiance is defined as a blunt resistance against proposed guidelines.[14] In the context of diabetes, such defiance may manifest itself even through the denial of the presence of the illness.[15,16] Hence, defiance involves the intentional rejection of diabetes self-management as compared to a mere lack of internalization of diabetes self-management. Accordingly, defiance has been referred to as a form of *anti-internalization*.[17]

Although SDT-based research in adolescents with type 1 diabetes is gaining increasing attention,[18] it remains relatively scarce. The beneficial role of internalized motivation for treatment adherence in the context of type 1 and type 2 diabetes has been demonstrated among adults[9,10,19] and defiance has been shown to be associated with detrimental developmental outcomes in community adolescents.[20] However, both concepts have not been examined in detail among adolescents with type 1 diabetes. This is surprising, given the importance of motivation in following the demanding guidelines for daily self-management and given that adolescence is a developmental period notorious for defiance against rules, such research is timely.[21,22]

SDT also posits that important socialization figures, including parents, can contribute to adolescents' quality of motivation.[12,22,23] Parents play a key role in treatment adherence for their adolescent children through their involvement in diabetes management and through the quality of their parenting style.[24–27] Previous research[28] illustrates that a positive, collaborative, warm, and authoritative parenting style enhances both metabolic and psychosocial outcomes (eg, health related quality of life, motivation), as opposed to a more intrusive and controlling and authoritarian style.[29–31] As most parents consider treatment adherence important, they actively express expectations about self-management behaviors. Such communication of clear expectations provides predictability to adolescents, such that adolescents know better what to do under which circumstances. SDT assumes that, for adolescents to fully internalize guidelines (and to avoid defiance), parents' communication style of expectations matters.[12,32] Applied to type 1 diabetes, parents using an autonomy-supportive style explain the personal relevance of the diabetes self-care, while accepting their adolescents' perspective rather than opposing possible negative feelings elicited by treatment guidelines ("*Let's talk about it*"). Such a style should contribute to adolescent's ownership and internalization of diabetes self-management and prevent defiance. In contrast, controlling parents seek treatment adherence through pressuring strategies such as threats of punishment, withdrawal of privileges, expression of disappointment and criticism, or the use of guilt-trips ("*Just do what I tell you or else…*"). Such a style hinders internalization and may even provoke defiance. In previous diabetes research, parents' general rearing style has been shown to impact adolescents' treatment adherence, with a general controlling style being negatively associated with adherence.[25] However, effects of parents' communication of expectations toward diabetes self-management and their communication style (ie, in an autonomy-supportive or controlling manner) require further study.

The objective of the present study is to examine associations among diabetes-specific parental communication, adolescents' internalization of and defiance against diabetes self-management, and treatment adherence to type 1 diabetes, using a multi-informant perspective. The hypothesized model of their relations (see Figure 1) is likely driven by shared method variance, leading us to utilize this multi-informant approach, including both adolescent and parental reports. Also, as adolescents provided separate reports of maternal and paternal perceived parenting, two models are assessed: Model 1: adolescent reports on (a) maternal parenting, and (b) paternal parenting and Model 2: (a) maternal and (b) paternal reports of parenting and adolescent treatment adherence. In both Models 1 and 2, the adolescent reports of motivation were used.

2 | METHODS

2.1 | Participants and procedure

Participants were adolescents with type 1 diabetes meeting the following criteria: (a) type 1 diabetes for at least 6 months, (b) aged 11–18 years, and (c) Dutch-speaking. Adolescents and their parents were recruited from seven Belgian hospitals. Patients with other severe somatic or psychiatric diagnoses (eg, cystic fibrosis, autism) and cognitive disabilities were excluded. Adolescents meeting the inclusion criteria and their parents were contacted through e-mail with a link to the online questionnaires using a secured web survey. Data collection took place in 2016. All participants signed an online-informed assent or consent form and parents gave active informed consent for their adolescent's participation. The study was approved by central and local Institutional Review Boards of participating centers prior to implementation of any study procedures.

2.2 | Measures

2.2.1 | Degree and style of parental expectations toward diabetes treatment (reported by adolescents, mothers, and fathers)—

Adolescents received four statements about maternal and paternal expectations about diabetes self-management: measuring blood glucose values, injecting insulin, healthy eating, and physical activity (eg, "To what degree does your mother have clear expectations about how often you should measure your blood sugar values"). Similarly, mothers reported upon their own expectations toward their adolescent's diabetes treatment, as did fathers. Each statement was followed by questions about the quality of parental communication across these four self-care areas, adapted from a previously validated questionnaire.[32] The autonomy supportive scale reflected parental provision of a rationale, and an empathic and open-minded perspective (four items, eg,"My father gives me a meaningful explanation as to why he considers this to be important for me."). The controlling scale reflected pressuring parental behaviors (eight items, eg,"My mother would yell at me and tell me that otherwise I will be punished."). For parent self-reports, the items were adapted (eg, "I would be open to my adolescent's point of view and ask if my adolescent could find another way to change something in his self-care behavior"). All items were rated on a five-point Likert scale ("totally disagree" to "fully agree"). Reliabilities of the adolescent measure were acceptable, as were parent measures: α = .78/.86 and α = .76/.71 (adolescent and parent reported degree of maternal/paternal expectations), α = .88/.84 and α = .83/.75 (adolescent and parent reported maternal/paternal controlling communication style of expectations), and α = .87/.87 and α = .71/.76 (adolescent and parent reported maternal/paternal autonomy supportive communication style of expectations).

2.2.2 | Quality of motivation: internalization and defiance (reported by adolescents)—

Adolescents' motivation included self-assessment of internalization of and defiance against self-care recommendations. Internalization was assessed using a 18 item diabetes-specific version of the previously validated Self-Regulation Questionnaire (SRQ-Parental Rules[32]). Participants received the following information: "Your type 1 diabetes requires you to follow certain recommendations. For example, it is important that you measure your blood glucose values, that you inject yourself with insulin, that you eat

healthy, and that you are physically active. Please rate the following reasons to follow the recommendations concerning your type 1 diabetes." Participants then rated items reflecting the internalization continuum, from a low level of internalization (eg, "Otherwise I will be punished"), to intermediate (eg, "It makes me feel proud of myself"), to the most internalized level (eg, "I find these recommendations personally meaningful"). In accordance with procedures used in previous research,[32] we computed a composite score reflecting overall internalization. This survey demonstrated acceptable reliability (α = .82). Adolescents' perception of defiance against self-care was assessed with a four item survey, adapted from the previously validated survey by Vansteenkiste et al[14] (eg, "I rebel against the diabetes self-management"; α = .86). Participants responded to all 22 items on a five-point Likert scale, ranging from 1 ("totally disagree") to 5 ("totally agree").

2.2.3 | Treatment adherence (reported by adolescents, mothers, and fathers)

—Treatment adherence was assessed using the previously validated Diabetes Self-Management Profile-Self Report and Parent-Report surveys DSMP-SR and –PR.[33] These surveys are each 24-item measures quantifying adolescent self-management behaviors over the previous 3 months. The surveys underwent rigorous forward and backward translation into Dutch. Item responses included 2, 3, or 4-point Likert response scales. Survey reliabilities were adequate: α = .70 and α = .75/70 (adolescent and maternal/paternal proxy report). For Model 1, where adolescents report on their perceived maternal and paternal expectations, adolescent self-reports on treatment adherence are included. For Model 2, where parents report on maternal and paternal expectations, maternal and paternal reports on treatment adherence, respectively, are included.

2.2.4 | Diabetes-related and demographic characteristics—

Medical record review provided data on duration of type 1 diabetes, treatment (injection vs pump) and contemporaneous HbA1c (reported in % and mmol/mol). The HbA_{1c}-value closest to the date of the survey completion (ie, ± 3 months) was used. Information on age, sex, ethnicity, educational levels of family members, and family structure was obtained from parents in an online questionnaire.

2.3 | Statistical analyses

Analyses were conducted in three steps. First, Pearson correlations were conducted using SPSS v.24. Second, preliminary descriptive analyses were conducted. Multivariate Analysis of Variance (MANOVA) using Wilks' Lambda was used to test for mean differences based on sex and treatment type (injections vs pump) for study variables. Third, for the main analyses, Structural Equation Modeling (SEM) in Mplus Version 7.4[34] was used to test the hypothesized associations. To optimize the number of participants, we performed a missing data analysis, including all cases in the SEM (N = 136 adolescents, N = 110 mothers, N = 98 fathers). The significance of indirect effects linking (adolescent or parental-reported) parental expectations to HbA1c through adolescent motivation and treatment adherence (Model 1: adolescent self-report on maternal (a) and (b) paternal expectations, Model 2: maternal (a) & paternal report) was tested using the Model Indirect command. To evaluate model fit, the χ^2 index was used (should be as small as possible); the Comparative Fit Index (CFI; should exceed 0.90 for adequate fit and 0.95 for excellent fit); the Root Mean Squared

Error of Approximation (RMSEA; should be less than 0.08 for adequate fit and 0.06 for excellent fit); and the Standardized Root Mean Square Residual (SRMR; should be less than 0.09).[35]

3 | RESULTS

3.1 | Sample characteristics

Of the 360 contacted adolescents, a total of 136 (37.8%) adolescents completed the online surveys. There were 171 (47.5%) mothers and 121 (33.6%) fathers also completing the questionnaires. For the current analyses, only complete dyads of adolescents with their mothers (N = 110) and with their fathers (N = 98) were used. The adolescents had a mean age of 14.4 years (SD = 2.10); about half were female (N = 74; 54.4%). Mean HbA1c was 7.35% (SD = 1.01; 57 mmol/mol, SD = 11). Mean illness duration was 6.18 years (SD = 3.77). Only 27.4% of adolescents received insulin pump therapy. The majority were part of an intact family (80.8%) and had Belgian nationality (96.8%). Most adolescents were receiving secondary education (82.8%) while a minority received primary (11.5%) or higher education (5.7%). With regard to parents, most parents had a college or university degree (66.4% of mothers and 61.3% of fathers) and worked (93.7% of mothers and 96% of fathers).

3.2 | Correlational analyses

Pearson correlations among the study variables are presented in Tables 1 and 2 for adolescent reports in Model 1 and parent reports in Model 2, respectively.

Across respondents, parental expectations were positively correlated with an autonomy-supportive style of parental communication. Further, both degree of parental expectations and parental autonomy-supportive communication were generally positively related to adolescent internalization and negatively to adolescent defiance (albeit stronger in adolescent reports). In turn, parental controlling communication was negatively associated with adolescent internalization and positively to defiance. Only in adolescent reports, there was a significant negative correlation between autonomy supportive parental communication style and adolescent defiance. Finally, adolescent internalization correlated positively with treatment adherence and negatively with HbA1c whereas the opposite pattern of correlations were evident for adolescent defiance, with a negative correlation with treatment adherence and a positive correlation with HbA1c.

3.3 | Descriptive analyses

First, with regard to gender differences, multivariate analysis including all adolescent outcomes indicated that gender did not yield any multivariate effect (F[7,128] = 1.185, P = .316, η^2 = 0.061 and F[7,128)] = 0.989, P = .442, η^2 = 0.051), nor with mother and father reports of these variables (F[7,102] = 0.472, P = .853, η^2 = 0.031 and F[7,90] = 1.027, P = .418, η^2 = 0.074). With regard to univariate effects, boys scored higher than girls on self-reported treatment adherence and in the adolescent–father dyads, boys reported higher on the quality of internalization than girls.

Second, with regard to insulin administration type, including all adolescent outcomes we did not find significant multivariate effects (F[7,127] = 1.352, P = 231, η^2 = 0.069 and F[7,127] = 1.956, P = .066, η^2 = 0.097), nor with the mother and father reports of these variables (F[7101] = 0.943, P = .477, η^2 = 061). With regard to univariate effects, in adolescent reports, pump-treated adolescents scored lower on internalization and on maternal as well as paternal expectations.

Further, correlational analyses showed that age as well as illness duration were positively correlated with HbA1c. In adolescent but not parent reports, age was negatively correlated with treatment adherence. In adolescent reports on paternal parenting, as well as in mother reports, age was also correlated with parental expectations. In both mother and father reports, illness duration was correlated to treatment adherence whereas in father reports it was also correlated to autonomy support and in mother reports to maternal expectations.

3.4 | Primary analyses

We tested the theory-based model depicted in Figure 1 through SEM four times (ie, Model 1: adolescent report on maternal (a) and (b) paternal expectations, Model 2: maternal (a) and paternal report (b). In testing these hypothesized models (see Figures 2 and 3), we controlled for significant associations found in the preliminary analyses above.

Model 1a (adolescent-reported maternal parenting) provided a good fit of the data across all indices (df = 28; χ^2 = 41.317, P = .0502; RMSEA = 0.059; CFI = 0.931; SRMR = 0.061) and so did the Model 1b (adolescent-reported paternal parenting) (df = 27; χ^2 = 27.642, P = .4296; RMSEA = 0.013; CFI = 0.997; SRMR = 0.043). In Model 1a, all indirect effects linking maternal expectations to HbA1c were significant: from expectations (point estimate = −.097, SE = .047, P = .039), from controlling expectations (point estimate = .092, SE = .038, P = .016), and from autonomy-supportive expectations (point estimate = −.094, SE = .039, P = .016). In the paternal model 1b, indirect effects from expectations (point estimate = −.144, SE = 0.050, P = .004) and controlling expectations (point estimate = .132, SE = 0.039, P = .001) were significant in their link to HbA1c, whereas the indirect effect from autonomy-supportive expectations was not significant (point estimate = −.022, SE = 0.017, P = .208).

Perceived maternal and paternal expectations were consistently negatively associated with defiance, and perceived paternal, but not maternal expectations were positively associated with internalization. Both maternal and paternal controlling communication style of expectations were negatively associated with internalization and positively with defiance. Both maternal and paternal autonomy-supportive communication style of expectations were positively associated with internalization. Maternal (but not paternal) autonomy-supportive communication style of expectations was negatively associated with defiance. In turn, defiance was consistently negatively associated with treatment adherence and positively with HbA1c. Internalization was marginally positively associated with treatment adherence (P < .10) in the maternal model, whereas it was marginally negatively associated with HbA1c in the paternal model (P < .10).

Model 2a (mother-reported parenting) provided an excellent fit to the data across all indices (*df* = 15; χ^2 = 17.159, *P* = .3094; RMSEA = 0.036; CFI = 0.982; SRMR = 0.050) and so did Model 2b (father-reported parenting) (*df* = 19; χ^2 = 17.306, *P* = .5692; RMSEA = 0.000; CFI = 1.000; SRMR = 0.048). In Model 2a, indirect effects linking maternal controlling expectations to HbA1c were significant (point estimate = .186, SE = .066, *P* = .005). However, the indirect effects from expectations (point estimate = −.007, SE = .045, *P* = .875) and from autonomy-supportive expectations (point estimate = −.045, SE = .038, *P* = .232) were not significant. In Model 2b, indirect effects linking paternal expectations to HbA1c were significant (point estimate = −.172, SE = .080, *P* = .031). However, the indirect effect from controlling expectations was not significant (point estimate = .034, SE = .035, *P* = .333).

As in adolescent reports, maternal and paternal expectations were consistently negatively associated with defiance, and paternal, but not maternal expectations, were positively associated with internalization. Again, as in adolescent reports, both maternal and paternal controlling communication style of expectations were negatively associated with internalization and positively with defiance (albeit the latter association did not appear in paternal reports). Only maternal autonomy-supportive communication style of expectations was positively associated with internalization and, contrary to findings in adolescent reports, no associations were found with defiance. Contrary to more robust findings in adolescent reports, defiance was marginally negatively associated with treatment adherence in the maternal model only (*P* < .10). Parallel to adolescent reports, defiance was consistently positively associated with HbA1c in both maternal and paternal models. Finally, internalization was marginally positively associated with treatment adherence (*P* < .10) in the maternal model, and–more robustly than in adolescent reports–negatively associated with HbA1c in both maternal and paternal models.

4 | DISCUSSION

This study examines the role of parental expectations and communication style in the prediction of adolescent motivation to adhere to self-management for type 1 diabetes, from the perspective of the adolescent and their mothers and fathers. Grounded in SDT, a differentiation between an autonomy-supportive and controlling communication style was made and both the degree of acquired ownership (ie, internalization) of and defiance against self-care recommendations were considered as underlying motivational processes. Several theoretically meaningful and clinically relevant findings emerged.

First, results generally showed a positive link between parental expectations about diabetes treatment and the quality of adolescent motivation to follow diabetes guidelines: parental expectations about diabetes treatment were positively associated with greater ownership or internalization of diabetes self-care recommendations and negatively with defiance against these guidelines. Consistent with developmental research,[36] these findings suggest that parents are generally perceived by adolescents as having legitimate authority to express expectations toward their adolescent's health.

In addition to the communication of clear expectations per se, parents' style of communicating also mattered. As expected, from the adolescent's perspective, an autonomy-supportive style of communicating these expectations was positively associated with adolescents' internalization of diabetes self-care recommendations, whereas a controlling style of communicating these expectations was more strongly negatively associated with internalization. Specifically, from the perspective of the adolescent, when parents provided a meaningful rationale for diabetes self-care, with room for negotiation and with respect for the adolescent's perspective, this was related to greater internalization of and less defiance against diabetes guidelines. In contrast, a controlling communication style, which involves pressuring the adolescent to comply with diabetes guidelines, was related to poorer internalization of and even defiance against these guidelines. These findings suggest that parents' intrusive interference with respect to health-related issues may be counter-productive. Although parent and adolescent reports of controlling communication style were similarly related to adolescent motivation, associations between autonomy support and adolescent motivation were less pronounced. More specifically, in both mother and father report there was no significant association between autonomy supportive communication and defiance. This finding may point to a greater positive impact of parental autonomy support on internalization, rather than on the avoidance of defiance, and to the importance of the adolescent's rather than the parent's perspective on parental communication.

Interestingly, across informants, some differential results emerged for mothers and fathers: paternal but not maternal expectations were positively linked with internalization, and in adolescent reports, maternal but not paternal autonomy-supportive communication strategies were related to less defiance. Although this informant-specific pattern of findings deserves replication, these results suggest a more pronounced role for fathers in the setting of expectations, whereas–from the adolescent's perspective–mothers' autonomy-supportive style seems to play a more prominent role when it comes to avoiding defiance. Further, in father's reports on controlling communication, contrary to all other informants, no association was found with defiance, which may again point to the importance of the adolescent's rather than parent's perspective on parental communication. Overall, this pattern of findings confirms that fathers–who have largely been understudied–as well as mothers play a vital role in diabetes management (especially from the perspective of the adolescent), an issue that deserves further clinical exploration (eg, how to involve fathers more actively).

A second set of findings relates to the associations of defiance and internalization with treatment adherence and glycemic control. As expected, defiance was generally negatively associated with treatment adherence, and positively with HbA1c, pointing to the clinical importance of this concept. Further, although raw correlations of internalization with treatment adherence and with HbA1c were significant, the unique contributions of internalization in the prediction of both diabetes outcomes were attenuated in the SEM. Whereas internalization trended toward significance in the model with adolescent reports, a significant association emerged in the models with parent reports. We offer two possible explanations for the lack of associations in the adolescent reported path analyses. First, even when adolescents have established ownership (ie, internalization) over diabetes self-care, they may still find it difficult to translate self-care desires into actual self-management

behaviors. Furthermore, consistent performance of self-care behaviors suggests that adolescents may understand long-term health benefits, which in general is contrary to adolescents' focus on the present. Because this ability to think ahead and to set priorities is developing well into early adulthood[37] and because adolescents differ in these capacities,[38,39] it is important to examine the interplay between internalization and individual differences (eg, executive functioning). Next, although we modeled internalization and defiance as simultaneous predictors of treatment adherence, internalization and defiance are not necessarily independent, as individuals scoring low on internalization may be more prone to defiance which, in turn, could play into treatment adherence and/or glycemic control. Future research can examine whether internalization is related to treatment adherence and glycemic control through defiance.

4.1 | Clinical implications

Provided that the findings are replicated longitudinally, important implications for health care teams can be drawn from this research. Parental style of communication of adolescent diabetes self-care and adolescents' motivation for self-care, may be actionable areas for intervention during routine diabetes care visits, especially as both assets can be readily identified during clinical encounters. Additionally, our findings suggest an important role in treatment adherence.

First, it might be beneficial for clinicians to engage in a dialogue with parents about how they communicate their expectations toward their adolescents' self-care. Parents can be encouraged to express clear and realistic expectations in a collaborative and autonomy-supportive manner, while avoiding the use of controlling and manipulative techniques (eg, threatening to punish the non-adherent adolescent or over-emphasizing the negative health consequences of poor diabetes management). Members of the multidisciplinary team (ie, doctor, nurse, dietician, and psychologist) can play important roles by modeling an autonomy-supportive communication style of diabetes self-care recommendations, by offering encouragement, and by giving positive feedback rather than criticizing the diabetes management. For example, one can potentially enhance adolescents' motivation for self-care through motivational interviewing techniques,[40] which are consistent with an autonomy-supportive approach.

Second, screening adolescents on their motivational functioning (ie, more or less personally internalized vs defiant), may identify those at risk for poor treatment adherence, allowing for timely clinical intervention.

Third, family-based interventions[41,42] and the more cost-effective multi-family group interventions,[43] may provide opportunities for parents and adolescents to discuss the quality of parental communication as well as adolescents' motivation. In multi-family group intervention, adolescents as well as parents benefit from the support of other families. Integrating a psycho-educational component in these interventions for parents on age-appropriate involvement and communication with their adolescent can be helpful. Past research has shown that this style of communication can be modeled to parents through workshops.[44]

4.2 | Limitations and suggestions for future research

First, directional paths imply causality–an assumption that cannot be tested with cross-sectional data. Therefore, the model tested should be replicated using longitudinal design. Although the causal order linking diabetes-specific parenting to diabetes-specific motivation was based on previous research in SDT, diabetes-specific motivation and behavior could, in turn, influence parenting style. For instance, defiance or a lack of internalization and the problems in treatment adherence associated with it could, out of a sense of parental helplessness, elicit more controlling and less autonomy-supportive parenting,[14] whereas more internalization and less defiance may create room for constructive and autonomy-supportive rather than controlling parenting,[12] Similarly, treatment adherence might not only function as an outcome of parental style and subsequent motivation but also an antecedent: when adolescents display low treatment adherence, and in particular when parents observe that HbA1c values are too high, they may respond in a more controlling manner.

Second, the representativeness of our sample may be questioned due to the relatively low HbA1c. Comparisons between the present sample and data taken from the Belgian Diabetes Registry for patients of similar ages indicate that our sample has better glycemic control (7.35% vs 8.2%) and a shorter duration of diabetes (6.18 vs 9.22 years). Further, with regard to defiance as well, the current sample seemed to score rather low (mean score = 1.5 on a 1–5 scale). Therefore, the present sample may represent a rather high functioning and selective sample. Future studies may target a larger and more heterogeneous sample including children and families from more diverse ethnic and educational background and with a wider range of HbA1c values.

Third, the response rate of our surveys was under 50%, yet it is equivalent to other studies in adolescents with type 1 diabetes using national patient registries eg, ([45]).

Fourth, the finding that adolescents on pump therapy score lower on parental expectations than those on injections, may have to do with the formulation of the item for parental expectations (“My parent has clear expectations with regard to how much insulin I need to deliver to myself”), which may be less relevant to adolescents on pump therapy. Future research using this questionnaire would do well to adapt the wording more specifically to pump users (eg, by adding an example about bolusing to the more general phrase of insulin delivery). Further, given the technological advances in diabetes care, future research should include assessment of CGM use.

Lastly, future studies may benefit from assessing adolescents’ feelings of effectiveness and confidence in handing their diabetes, as greater perceived competence has been found to predict more positive health behavior changes.[10] This might be particularly important for youth with type 1 diabetes as an autonomy supportive environment may enhance youth’s motivation for following self-care recommendations, which, in turn, may be positively linked to perceived competence for diabetes self-management and to treatment adherence. [10,46] Furthermore, future research could benefit from examining autonomy-support in an intervention trial.

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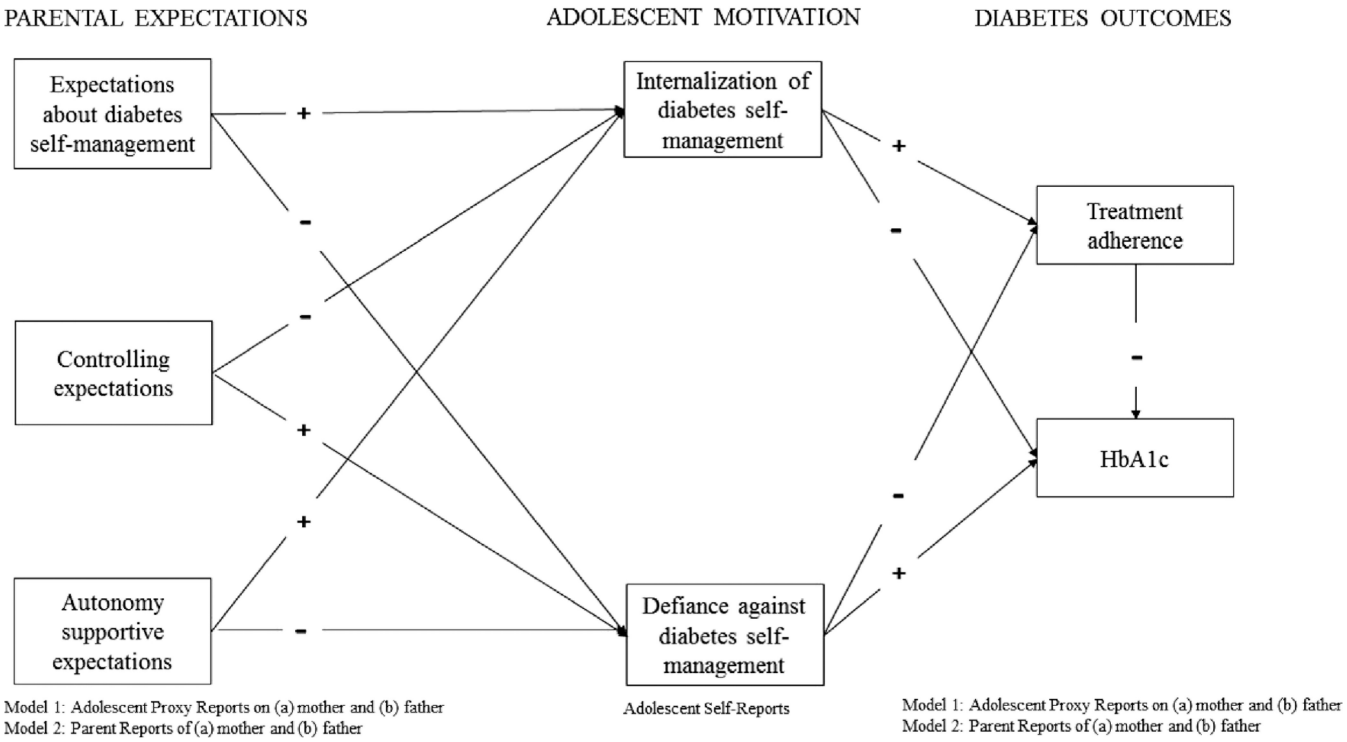

FIGURE 1.

Hypothesized path model linking diabetes-specific parenting across diabetes-specific motivation to diabetes outcomes

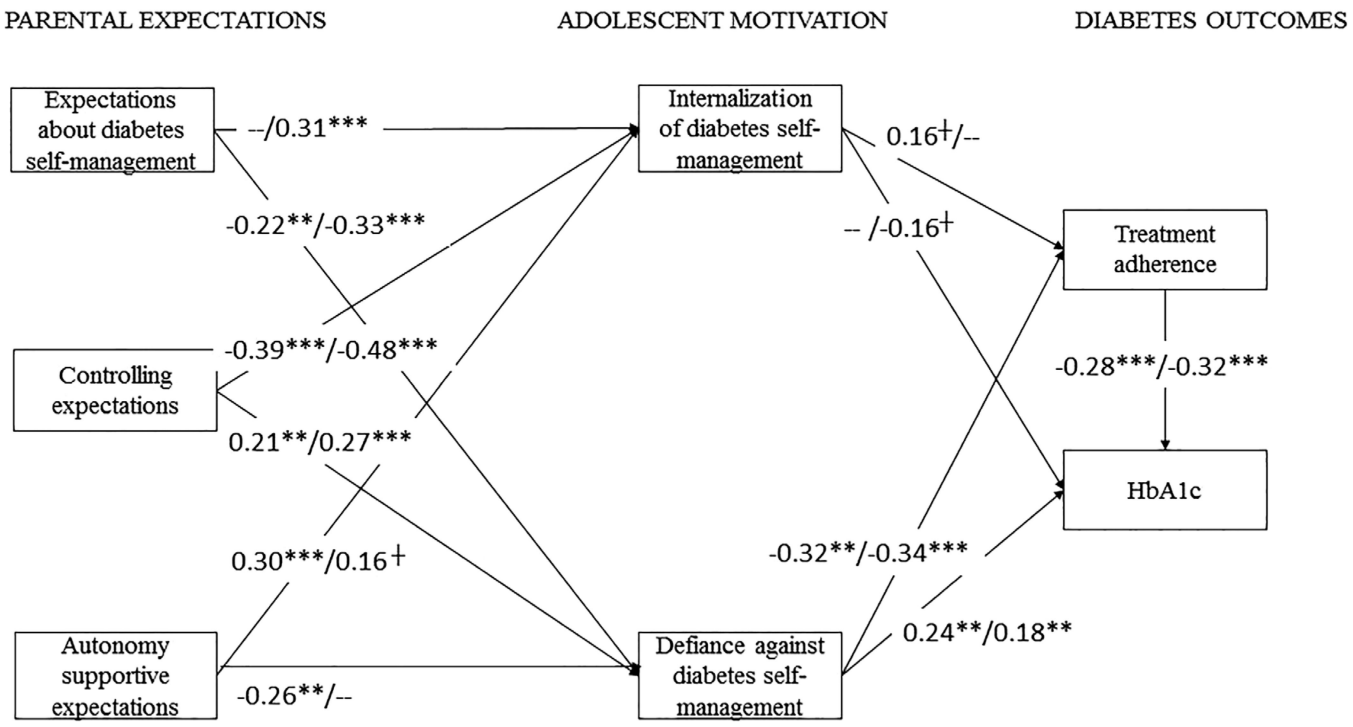

FIGURE 2.

Final path model containing adolescent reports linking diabetes-specific parenting across diabetes-specific motivation to diabetes outcomes. Associations with gender, age, illness duration, and insulin administration type, associations among the different parenting styles, motivation styles, and diabetes-related outcomes are not shown for reasons of clarity. All coefficients are standardized estimates. Coefficients before the slash are adolescent reports on maternal parenting (Model 1a), after the slash on paternal parenting (Model 1b). † $P < .10$. * $P < .05$. ** $P < .01$. *** $P < .001$

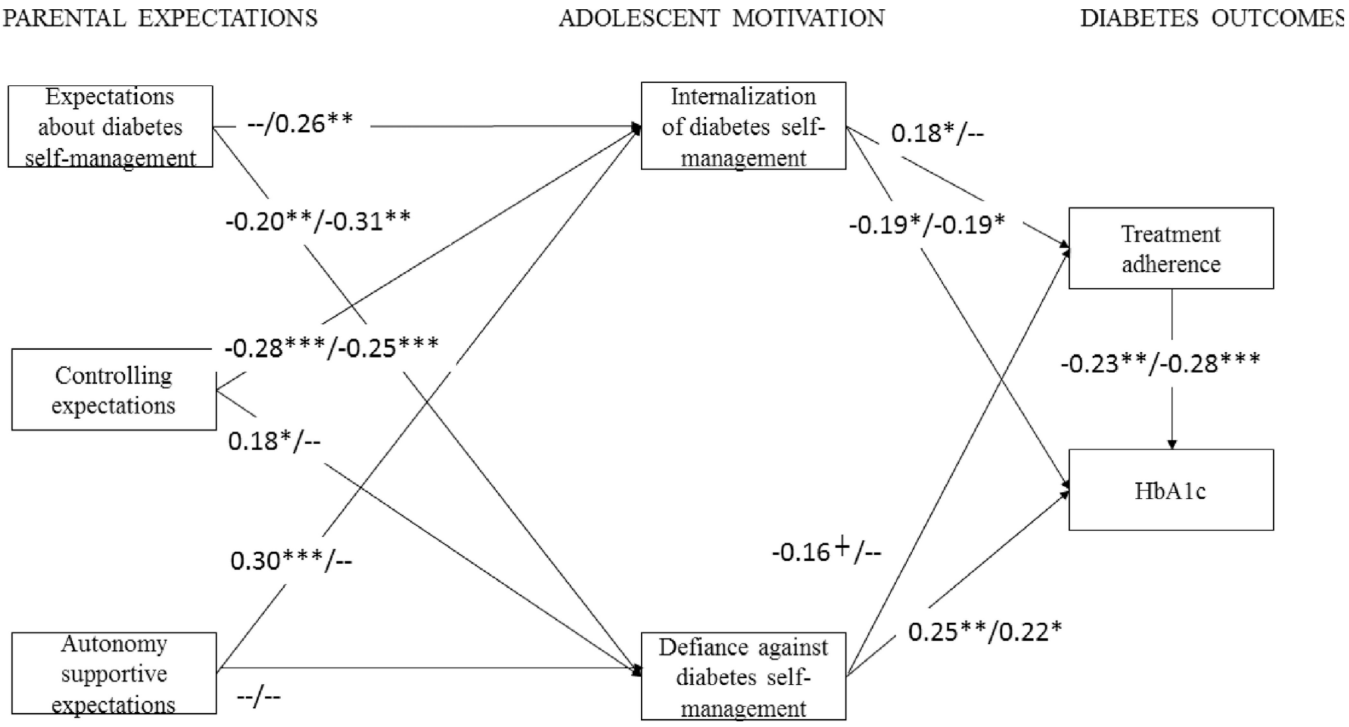

FIGURE 3.

Final path model containing parent reports linking diabetes-specific parenting across diabetes-specific motivation to diabetes outcomes. Associations with gender, age, illness duration, and insulin administration type, associations among the different parenting styles, motivation styles, and diabetes related outcomes are not shown for reasons of clarity. All coefficients are standardized estimates. Coefficients before the slash are mother reports (Model 2a), after the slash father reports (Model 2b). $^{\dagger}P < .10$. * $P < .05$. ** $P < .01$. *** $P < .001$

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TABLE 1

Descriptives and Pearson correlations among the study variables–Model 1 (adolescent reports)

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
Expectations							
1. Expectations	-						
2. Controlling style	.09/.21 *	-					
3. Autonomy supportive style	.45 **/.56 **	−.13/−.13	-				
Motivation							
4. Internalization	.22 **/.32 **	−.40 **/−.38 **	.41 **/.39 **	-			
5. Defiance	−.30 **/−.36 **	.22 */.19 *	−.38 **/−.36 **	−.57 **	-		
Diabetes outcomes							
6. Treatment adherence	−.02/.19 *	−.10/.03	.08/.12	.37 **	−.42 **	-	
7. HbA1c (%)	−.01/−.18 *	.33 **/.20 *	.00/−.19 *	−.37 **	.41 **	−.46 **	-
M	4.18/3.77	2.01/1.89	3.97/3.74	3.48	1.51	58.80	7.35
SD	0.71/0.95	0.90/0.77	0.99/1.06	3.13	0.68	10.11	1.00

* $P < .05$.

** $P < .01$.

*** $P < .001$. Coefficients before the slash are correlations with adolescent reported maternal parenting practices, coefficients after the slash with adolescent reported parental parenting practices

TABLE 2

Descriptives and Pearson correlations among the study variables–Model 2 (parent reports)

	1.	2.	3.	4.	5.	6.	7.
Expectations							
1. Expectations	-						
2. Controlling style	.08/−.18	-					
3. Autonomy supportive style	.40**/.52**	−.20*/−.21*	-				
Motivation							
4. Internalization	.04/.30**	−.30**/−.30**	.17/.17	-			
5. Defiance	−.04/−.30**	.19*/.15	−.13/−.11	−.53**	-		
Diabetes outcomes							
6. Treatment adherence	.20*/.41**	−.08/−.08	.09/.43**	.30**/.17	−.27**/−.13	-	
7. HbA1c (%)	−.01/−.17	.33**/.23**	.00/−.19**	−.37**	.42**	−.46**	-
M	4.39/4.40	1.60/1.72	4.43/4.38	3.57/3.75	1.43/1.40	60.51/60.76	7.28/7.27
SD	0.64/0.55	0.63/0.66	0.56/0.49	2.99/2.79	0.63/0.59	7.99/8.21	1.01/1.00

*$P < .05$.

**$P < .01$.

***$P < .001$. Coefficients before the slash are correlations with mother reported parenting practices, coefficients after the slash with father reported parenting practices.