Motivating gifted and non-gifted students in regular primary schools:

A self-determination perspective

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Abstract

Self-determination theory posits that students' motivation is fostered when students' basic psychological needs for autonomy, competence, and relatedness are satisfied. There are indications that teachers support the needs of gifted students differently than the needs of non-gifted students. However, research on need support and need satisfaction among gifted students is scarce as well as research on how motivation of gifted students can be promoted. Questionnaires were filled out by 1,975 Grade 3 to 6 students (10.5% gifted according to teacher nominations) and their teachers (n=80) from eleven primary schools in the Netherlands. Teacher reports indicated that teachers provided gifted students with more autonomy, less structure, and equal levels of involvement compared to non-gifted students. Furthermore, gifted students perceived equal levels of autonomy satisfaction and relatedness satisfaction with their teachers, but reported more competence satisfaction, and less relatedness satisfaction with classmates than non-gifted students. Gifted students also reported higher levels of adaptive as well as more maladaptive forms of motivation than non-gifted students. Finally, relations between need support, need satisfaction, and motivation were similar for gifted students and non-gifted students, indicating that, similar to non-gifted students, motivation of gifted students can be fostered when their basic psychological needs are satisfied.

Keywords: gifted, motivation, self-determination theory, need support

1. Introduction

Many gifted students do not fully realize their potential, despite the outstanding cognitive abilities characterizing these students (e.g., Siegle & McCoach, 2018; Worrell, Subotnik, Olszewski-Kubilius, & Dixson, 2019). A lack of motivation has often been suggested to be an underlying cause of underachievement (Preckel, Holling, & Vock, 2006; Snyder & Linnenbrink-Garcia, 2013). Self-determination theory (SDT) posits that students' motivation is fostered when students basic psychological needs for *autonomy*, *competence*, and *relatedness* are supported (Deci & Ryan, 1985). Given motivational problems that gifted students may encounter in regular classes, the question arises whether need-supportive teaching can foster gifted students' need satisfaction and thereby their motivation for school in similar ways as has been found for non-gifted students (for a review, see Stroet, Opdenakker, & Minnaert, 2013). Yet, teachers might not offer the same level of need support to gifted students as to other students (e.g., gifted students might receive less guidance by their teachers to feel supported in their need for competence). Therefore, the first aim of the present study was to examine whether teachers in regular primary school classrooms provide gifted and non-gifted students with similar levels of need support, and whether gifted students and non-gifted students report similar levels of need satisfaction and motivation. The second aim was to examine whether associations between need satisfaction and student motivation are similar for gifted and non-gifted students. Thereby, the results of the present study could give insight in how to organize and better serve the motivational needs of gifted students within the general classroom.

1.1 Giftedness

In research and practice, there is considerable variation in the definition of giftedness (Pfeiffer, Shaunessy-Dedrick, Foley-Nicpon, 2018). Classic definitions assume very high scores on a general intelligence factor (*g*-factor) (Terman, 1925 as cited in Dai, 2018). Recent definitions are more multidimensional in nature, by focusing on different types or subfactors of intelligence and thereby giftedness (e.g., Sternberg, 2018) or requiring high levels of non-cognitive factors such as creativity and motivation (Renzulli & Reis, 2018). Moreover, developmental perspectives of giftedness focus on

talent development rather than on stable dispositions (Gagné, 2018; Subotnik, Olszewski-Kubilius, & Worrell, 2011, 2018). Despite the broadening of the concept, intelligence remains an important criterion for giftedness, in part because it explains common variance between different talent components and predicts talent development across time (Worrell et al., 2019).

In educational practice, identification of children who are potentially gifted and thereby eligible for additional services for gifted children often relies strongly on nominations by teachers (Hertzog, Mun, DuRuz, & Holliday, 2018; Siegle, Moore, Mann, & Wilson, 2010). Criteria for teachers to identify students as gifted are mostly based on cognitive factors, including intelligence and achievement, but also non-cognitive factors, such as motivation, creativity, or personality (Endepohls-Ulpe & Ruf, 2006). As the present study focuses on teachers' behaviours toward gifted students, we focused on students who are gifted *according* to their teacher, either because they were officially classified as gifted or because the teacher suspected these students to be gifted.

1.2 Motivation

Motivation is considered an important prerequisite for learning. SDT distinguishes different types of motivation. Students are *intrinsically* motivated when an activity is pursued because it is satisfying. *Extrinsic* motivation occurs when an activity is not undertaken because of the satisfaction of the activity itself, but because of external reasons. Four types of extrinsic motivation can be distinguished, varying in the degree to which they are self-determined: *integrated*, *identified*, *introjected*, and *external* regulation (Ryan & Deci, 2000a). In case of *integrated regulation*, the student internalizes identified reasons for an action so these reasons become congruent with other values and needs. Students with high levels of *identified motivation* consider the results of the activity to be valuable or important even though they may not find the activity satisfying. Students with high levels of *introjected regulation* are motivated by internal pressures, such as a sense of pressure to avoid guilt and fear. Students' motivation is externally regulated when students perform an activity for an external reward or to avoid punishment (Gagné & Deci, 2005). In addition, *amotivation* refers to a lack of motivation and occurs when an activity is neither intrinsically nor extrinsically motivating to a student (Legault, Green-Demers, & Pelletier, 2006). Consistent with the notion that high-quality

motivation predicts better learning outcomes, intrinsic motivation has been found to be associated with beneficial outcomes, such as deep learning, better performance, and higher psychological well-being (e.g., Guay, Ratelle, Roy, & Litalien, 2010; Levesque, Zuehlke, Stanek, & Ryan, 2004; Vansteenkiste, Simons, Lens, Soenens & Matos, 2005; Soenens & Vansteenkiste, 2005). Conversely, less self-determined forms of motivation and amotivation have been found to be associated with several maladaptive outcomes, such as boredom, procrastination, superficial learning strategies, test anxiety, and lower school results (Aelterman et al., 2012; Ntoumanis, 2001; Pelletier, Fortier, Vallerand, & Briere, 2001; Shen, Wingert, Sun, & Rukavina, 2010; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). For a full understanding of students' motivation, all these motivational dimensions need to be considered. That is, higher levels of motivation do not necessarily imply better motivation, because the *quality* of the motivation is dependent on the different types of motivation that an individual endorses (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

Whereas the motivational dimensions described above refer to students' reasons for engaging in their school work (or absence thereof), *behavioural engagement* can be considered as the behavioural expression of students' motivation (Skinner, Kindermann, & Furrer, 2009; Reeve, Jang, Carrell, Jeon, & Barch, 2004). It refers to students' involvement in their schoolwork and entails the onset, intensity, and perseverance of effort (e.g., Skinner & Belmont, 1993) and is strongly associated with students' school performance (e.g., Furrer & Skinner, 2003).

1.3 Gifted students' motivation

Motivation is often considered to be essential for talent development and performance in gifted students (McCoach & Flake, 2018). Studies comparing the motivation of gifted and non-gifted students suggested that on average gifted students report higher levels of intrinsic motivation compared to non-gifted students (Davis & Connell, 1985; Gottfried & Gottfried, 1996; Vallerand, Gagné, Senécal, & Pelletier, 1994). Furthermore, gifted and non-gifted students have been found to report similar levels of performance goals, which can be considered an external type of motivation (Meier, Vogl, and Preckel, 2014; Preckel, Goetz, Pekrun, and Kleine, 2008). Even though these studies suggest that on average gifted students report higher levels of intrinsic motivation and similar

levels of external regulation, not all gifted students appear to be characterized by high-quality motivation (McCoach & Flake, 2018). More insight is needed in motivational differences between gifted and non-gifted students, especially regarding more externally regulated types of motivation and amotivation, to gain a better understanding of the *quality* of gifted students' motivation, rather than only the *quantity* of their motivation.

1.4 Need satisfaction and need-supportive teaching

According to SDT, all humans have three fundamental psychological needs: the need for autonomy, competence, and relatedness. When the social context fulfils these needs, psychological growth is promoted (Ryan & Deci, 2000b; Vansteenkiste & Ryan, 2013). Accordingly, research in educational settings has indicated positive associations between need-supportive teaching and students' motivation and school engagement (Stroet et al., 2013).

The need for autonomy refers to the desire of people to be causal agents and to experience volition in their actions (Deci & Ryan, 1985; Ryan & Deci, 2000b). *Autonomy-supportive teaching* includes providing choice, explaining the relevance of learning tasks, acknowledging negative feelings, and nurturing students' inner motivational resources (Skinner & Belmont, 1993; Stroet et al., 2013; Su & Reeve, 2010). The need for competence refers to the need to feel effective and in control, and to be able to stretch one's capabilities. Teachers can facilitate this need by providing *structure*, which involves the provision of clarity, help, guidance, and encouragement (Skinner & Belmont, 1993; Stroet et al., 2013), by providing contingent feedback, and by adjusting instruction and materials to students' ability levels (Skinner & Belmont, 1993). Hereby, students understand what is expected of them and how they can effectively meet these expectations (Jang, Reeve, & Deci, 2010). Students' need for relatedness refers to the desire to feel connected to others and to experience a sense of belongingness (e.g., Baumeister & Leary, 1995; Ryan, 1995). Teachers can support this need by expressing *involvement* in their students' lives, by showing affection, care, and interest, attuning to their students' needs, and by offering emotional support (Stroet et al., 2013).

1.5 Need support for gifted and non-gifted students

Within the same classroom, students can experience different levels of need satisfaction. This is apparent, for example, from relatively low intraclass correlations for measures of student-perceived need satisfaction and need-supportive teaching (e.g., Domen, Hornstra, Weijers, Van der Veen, & Peetsma, 2019; Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015; Hospel & Galand, 2016). Teachers vary in their degree of need support based on their expectations of students (Hornstra, Stroet, Van Eijden, Goudsblom, & Roskamp., 2018). As teachers tend to have higher expectations of gifted students (Garrett et al., 2015), teachers may offer different levels of need support to gifted students compared to non-gifted students (see below). Yet, even though the level of need support may differ for gifted and non-gifted students, associations between need support and motivation are expected to be mostly similar for gifted students compared to non-gifted students. That is, SDT states that the three basic psychological needs are universal needs, and benefits of need satisfaction are mostly similar for different (groups of) individuals, regardless of differences in need strength (Deci & Ryan, 2000; Van Assche et al., 2018). For example, autonomy satisfaction is expected to be positively related to intrinsic motivation for every student, irrespective of how strongly a student values autonomy. Prior research indeed offers some indications for the idea that need satisfaction indeed promotes the motivation of gifted students (see below).

In an exploratory study, Garn and Jolly (2014) found that several aspects of autonomy support (i.e., providing choice, offering relevant learning experiences) increased gifted students' intrinsic motivation. Moreover, Miserandino (1996) found that gifted students who felt that their need for autonomy was satisfied were more engaged in their schoolwork. Even though a direct comparison with non-gifted students is lacking in these studies, the findings are in line with findings obtained among broader samples of (mostly non-gifted) students showing that need satisfaction facilitates students' motivation (Stroet et al., 2013).

With regard to competence, it might seem that gifted students feel very competent because of their intellectual capabilities (e.g., Suldo, Hearon, & Shaunessy-Dedrick, 2018). However, gifted students can feel a need to live up to unrealistic expectations (Kesner, 2005) and may worry about their competence because of the pressure of having to look smart (Speirs Neumeister, 2007). A lack of self-perceived competence in gifted students has been associated with lower levels of behavioural

engagement (Miserandino, 1996). As discussed, structure facilitates students' need for competence and can be offered in different ways. Especially encouragement, expressed by high expectations and offering challenge, has been studied extensively as an effective strategy for gifted students (for a review, see Bailey, et al., 2012). There are indications that teachers provide high-ability students with less structure (Deunk, Smale-Jacobse, De Boer, Doolaard, & Bosker 2018), because they may think that gifted students do not need as much help and guidance as their classmates (De Boer, Minnaert, & Kamphof, 2013). According to this line of reasoning, the relation between structure (in terms of help and guidance) and student motivation might be weaker for gifted students compared to non-gifted students. However, if gifted students are challenged to perform at a level matching their cognitive abilities, i.e. performing within their 'zone of proximal development' (McGlonn-Nelson, 2005), they may also require high levels of structure to match these demands. In that case, it would be expected that the relation between structure and student motivation would be similar for gifted and non-gifted students.

Concerning relatedness, gifted and non-gifted students have both been found to value relatedness most as a desired teacher characteristic, followed by competence, and autonomy (Authors, 2019). Relatedness can be supported by positive relations with teachers as well as classmates. A common stereotype is that gifted students have social deficits (Preckel, Baudson, Krolak-Schwerdt, & Glock, 2015). However, empirical studies have not found evidence that gifted students are less socially competent than their non-gifted peers (e.g, Bain & Bell, 2004; Shechtman & Silektor, 2012). Yet, due to differences between gifted students and their same-age peers in abilities or interests, gifted children could still be more vulnerable than other children with regard to their socio-emotional development and their relationships with their classmates (e.g., Freeman, 1983; 2006). Prior research indicated that gifted students in regular classes experience their relationship with their teacher more negatively compared to students in specialized gifted programs (Vogl & Preckl, 2013; Zeidner & Schleyer, 1999). This suggests that regular classroom teachers may find it difficult to attend to the socio-emotional needs of gifted children and that gifted children may experience less relatedness with their teachers in regular classrooms than their classmates.

In all, the aforementioned findings suggest potential differences between gifted and non-gifted students in the level of need support and need satisfaction, but also suggest that need satisfaction is as important for gifted students as it is for their classmates. However, due to a lack of studies directly comparing the strength of the relationships between need satisfaction and students' motivation, it is unclear whether satisfaction of these need is indeed equally beneficial for gifted versus non-gifted students.

1.6 The present study

To examine how gifted students' motivation can be fostered in regular classes, the present study aimed to examine differences between gifted and non-gifted students in levels of need support, need satisfaction, motivation, and in the associations between these variables. We expected need satisfaction to mediate the relations between the provision of need support by teachers and students' motivation, as SDT states that the effects of the social context on student motivation are explained by how students experience the social context (e.g., Skinner, Furrer, Marchand, & Kindermann, 2008). Furthermore, to represent a broad scope of students' motivation, including the behavioural aspect of motivation, we included intrinsic motivation, extrinsic types of motivation, amotivation, and behavioural engagement. Regarding students' need for relatedness, most studies typically focus either on relatedness with the teacher (e.g. Stroet et al., 2015), relatedness with classmates (e.g. Jang, Kim, Reeve, 2016), or do not differentiate between different types of social actors (e.g., Chen et al., 2015). In the present study, we distinguished between teachers and classmates as distinct sources of relatedness as both form unique parts of students' social context. The following research questions were addressed in the present study.

1. To what extent do teachers report similar levels of need support (autonomy support, structure, and involvement) for gifted and non-gifted students?
2. To what extent do gifted students experience similar levels of need satisfaction as non-gifted students?
3. To what extent do gifted and non-gifted students differ in their motivation?

4. To what extent do relationships between teachers' need support, students' perceived need satisfaction and students' motivation differ between gifted and non-gifted students?

2. Method

2.1 Participants and procedure

The sample consisted of 1,975 students (M_{age}= 9.83, *SD* = 1.20, 50.2% girls) and 80 teachers from eleven primary schools in the Netherlands. These schools were all participating in POINT ('Passend Onderwijs voor Ieder Nieuw Talent' [Adequate Education for Every New Talent]). POINT is a research network in which primary schools collaborate with universities to conduct practice-oriented research. Most teachers were female (69.2%) and their average age was 37.5 years (*SD* = 11.5; age range 21-62 years). On average they had 13.1 years of teaching experience (*SD* = 9.8; *range* 0-42 years). Of the total potential sample (students in the selected classrooms), 74 students (3.7%) had missing data on all self-report scales because they were absent during data collection, and 57 students (2.9%) had partial missing data because they did not complete the questionnaire or missed a few questions.

Teacher nominations were used as a proxy for giftedness. Prior research suggests that teachers are better able to accurately identify gifted students compared to other referral sources (McBee, 2006). On a rating sheet, teachers were asked to indicate for each of their students whether they were officially classified as gifted by a licensed psychologist or whether they suspected them to be gifted, and why. Of the total sample, 204 students (10.3%) were considered to be gifted in the present study, including 77 students (3.9%) who were classified as gifted and another 127 students (6.5%) who were suspected to be gifted by their teachers. On average, each class contained 2.59 gifted students. Students not identified as gifted are referred to as 'non-gifted' in the remainder of the study. Of the

gifted students, 37.4% were girls, indicating an underrepresentation of girls, aligning with prior research (Bianco, Harris, Garrison-Wade, & Leech, 2011).

Data collection took place in February and March. In accordance with the guidelines of the Institutional Review Board, consent was obtained from parents, teachers, and students. Parents of nine students (0.45%) objected to participation. Before data collection, teachers filled out demographic information on each participating student, whether the student had been classified or was suspected to be gifted, and students' most recent achievement scores (see 'instruments'). Thereafter, schools were visited by a research assistant and students and teachers filled out the questionnaires during regular class. In most schools, the questionnaires were administered digitally: 75.0% of the students filled out the questionnaires on a laptop, using the platform LimeSurvey[1]. The questionnaires also contained additional scales not used in the present study.

2.2 Instruments

2.2.1 Student motivation

Established questionnaires were used to assess students' motivation. The scales were translated from English to Dutch using a back-translation procedure (Brislin, 1970). All items could be answered on a five-point Likert scale ranging from totally *not applicable to me* (1) to *totally applicable to me* (5). The self-regulation questionnaire academic (SRQ-A) (Ryan & Connell, 1989) was administered to assess students' motivation for school. It consists of four subscales with 16 items. The items were preceded by a question, for example 'Why do I work on my schoolwork?'. The four subscales were *intrinsic regulation* ("Because I enjoy doing my schoolwork."), *identified regulation* ("Because it's important to me to work on my schoolwork.") , *introjected regulation* ("Because I'll be ashamed of myself if it didn't get it done."), and *external regulation* ("Because I want the teacher to think I'm a good student."). Integrated regulation is not included as a separate subscale in the SRQ-A. *Amotivation* was assessed by the scale amotivation from the Academic Motivation Scale by Vallerand et al. (1992) and consisted of four items (e.g., "School does not interest me."). Lastly, *behavioural*

[1] *T*-tests indicated that the scores on the scales of the present study did not differ between students who filled out the questionnaires on paper and students who filled out the questionnaires digitally (all $p > .05$)

engagement was assessed by a five-item scale (e.g, "I pay attention in class") by Nie and Lau (2009) who adapted the scale from Steinberg, Lamborn, Dornbusch, and Darling (1992) and Wellborn and Connell (1987). Confirmatory factor analyses (CFAs) supported a six-factor model for both groups and indicated measurement invariance, i.e., the factor structure was similar for gifted and non-gifted students. Items with low factor loadings (<.30) were identified as ill-fitting and removed from the model (Perry, Nicholls, Clough, & Crust, 2015), resulting in the removal of one item from the external regulation scale and one item from the amotivation scale. The internal consistencies of each scale were above or approached the commonly recommended cut-off value for Cronbach's alpha of .70 (Peterson, 1994; Streiner, 2003). See the supplementary materials for a full description of the CFA results and internal consistencies.

2.2.2 Need satisfaction

Need satisfaction was assessed with the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015). Haerens et al. (2015) developed a Dutch version of the BPNSFS for the physical education domain. Items referring specifically to physical education were reformulated to refer to class in general (e.g., "I felt forced to do too many exercises" was reformulated to "I felt forced to do too many assignments in class"), which aligned with the original English version of the scale. The BPNSFS consists of six subscales, i.e., autonomy satisfaction, autonomy frustration, competence satisfaction, competence frustration, relatedness satisfaction, and relatedness frustration. Because the BPNSFS focuses on classmates with regard to satisfaction of the need for relatedness, we also used a seven-item scale by Peetsma, Wagenaar, and De Kat (2001) to assess *relatedness satisfaction with the teacher*. For all scales, the items could answered on a five-point Likert scale ranging from totally *not applicable to me* (1) to *totally applicable to me* (5). CFAs supported a four-factor model for both groups which included only the satisfaction scales for each need. However, subsequent reliability analyses revealed that internal consistency of the subscale autonomy satisfaction was unsatisfactory (α = .57) and removal of items could not improve the internal consistency. A four-factor model in which we added the items of autonomy frustration (loading negatively on the autonomy satisfaction scale) had better fit to the data than the previous

model and measurement invariance was confirmed for this model. Hence, the final model consisted of four scales, *autonomy satisfaction* (eight items, e.g., "I feel like I can choose many things myself."), *competence satisfaction* (four items, e.g., "I felt able to reach my goals."), *relatedness satisfaction with classmates* (four items, e.g., "I feel that the classmates I care about also care about me."), and *relatedness satisfaction with the teacher* (seven items, e.g, "I feel comfortable with my teacher."). Cronbach's alphas were all above α =.70. See the supplementary materials for a full description of the CFAs and internal consistencies.

2.2.3 Teacher-provided need support

Teachers rated the degree to which they provided individual students with *autonomy support*, *structure*, and *involvement*. To limit the time investment by the teachers, they provided ratings for a subsample of eight to ten students per class (N = 729). First, the students who were considered gifted were selected for this subsample, until this subsample included up to four gifted students per class (many classes had a lower number of gifted students). Thereby most gifted students of the present study were included (N = 159 gifted students; 35.8% girls). The subsample also included a randomly selected reference group of non-gifted students (N = 552 non-gifted students; 53.4% girls). Single item measurements were used to further limit the time investment by the teachers. Findings by Gogol et al. (2014) indicated that single item measures in motivational contexts correlate sufficiently with results of full scales. The items were based the Teacher As Social Context questionnaire (Belmont, Skinner, Wellborn, & Connell, 1988; Dutch version by Sierens et al., 2009). A back-translation procedure was used to translate the items to Dutch. The items could be answered on a five-point Likert-type scale ranging from 1 (not applicable) to 5 (totally applicable). Autonomy support was assessed with the item "I give this student a lot of choices.". Structure was assessed with the item "I give this student a lot of help and guidance during learning.". Involvement was assessed with the item "I have a good relationship with this student.". The correlation between autonomy support and structure was r = -.25, p < .001, the correlation between autonomy support and involvement was r = .16, p < .001, and the correlation between structure and involvement was r = .01, p = .83. These correlations correspond to

the results of a previous study (Authors, *submitted*) in which full scales instead of single-item measures were used.

2.2.4 Academic achievement

Students' most recent test scores in mathematics and reading comprehension were included as covariates, based on tests of the Dutch National Institute for Educational Measurement (CITO). Previous research showed these tests to be highly reliable ($\alpha > .80$; Evers, 2002; Feenstra, Kamphuis, Kleintjes, & Krom, 2010). Two different versions of the tests were used by the schools, an older and an updated version. The updated version contains extensions for special needs students and additional diagnostic tools for teachers (CITO, n.d.). Other than these extensions (which were not relevant to the present study), the tests were very similar in nature, but the scale of the scores of the two versions differed. To account for the different scales of both versions as well as differences between school years, scores were group-mean centered per class.

2.3 Data-analyses

To examine the research questions, path models were estimated in Mplus 7.4 (Muthén & Muthén, 2017). For the first research question regarding differences in teachers' need support, a path model was estimated with the three need support variables as dependent variables. In a first step of these analyses, we included student gender, grade level (school year), and achievement as covariates. Next, we added the dummy variable giftedness as a predictor to examine whether giftedness predicted need support by teachers, after taking into account the covariates. Similar analyses were performed for the second research question, with the four need satisfaction variables as dependent variables. To answer the third research question regarding differences in motivation, *t*-tests were performed to compare gifted and non-gifted students.

To examine differences between gifted and non-gifted students in the associations between need support, need satisfaction, and student motivation, a multigroup path model was estimated. Grade and gender were included as covariates. Group differences in the strength of the relations were tested by means of equality constraints. First an unconstrained multigroup model was estimated. Next,

equality constraints were added one by one. If model fit did not significantly worsen, the parameter was considered to be equal across groups (Kline, 2015). Different orders were also tested to ensure that the order of imposing equality constraints did not affect the findings. Next, non-significant relations were set to zero to obtain the most parsimonious model (Kline, 2015). Modification indices of the final (constrained) model were checked to see if there were no equality constraints that needed to be released. The significance of indirect paths (from need support to motivation via need satisfaction) was tested using a bootstrapping re-sampling procedure ($N = 1{,}000$).

Model fit was evaluated based on the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and the chi-square. A CFI above .90 indicates acceptable fit and above .95 indicates good fit of a model. An RMSEA below .05 indicates good fit, values between .05 and .08 indicate reasonable fit, and values above .10 indicate poor fit. A SRMR below .08 indicates good fit (Hu & Bentler, 1999; Kline, 2015). When comparing nested models, the Satorra-Bentler scaling correction was applied for the chi-square difference test (Satorra & Bentler, 2001), and ΔCFI > .020 and ΔRMSEA > .020 were considered as thresholds (Fan & Sivo, 2009).

The hierarchical structure of the data (students nested in classes) was taken into account by including “type = complex” in the Mplus syntaxes. Given the complexity of the (multivariate) models, it was not possible to include latent variables. Therefore factor scores based on the scalar invariance models were included in the models. The analyses were performed with MLR (maximum likelihood estimation with robust standard errors) as estimator to account for non-normality (see histograms in the supplementary materials).

3. Results

3.1 Preliminary analyses

First, students who were officially certified as gifted were compared to students suspected to be gifted . *T*-tests indicated no significant differences between these groups on most variables of

interest in the present study (*p* values > .05), except for structure and introjected regulation. Teacher reports indicated that they provided students suspected to be gifted with less structure (M = 2.31, SD = 1.07) compared to students certified as gifted (M = 2.95, SD = 1.30), $t(157) = -3.41$, $p = .001$. Additionally, students suspected to be gifted reported more introjected regulation (M = 3.59, SD = 0.76) than students certified as gifted (M = 3.31, SD = 0.70), $t(190) = 2.50$, $p = .013$. Furthermore, students suspected and certified as gifted did not statistically significantly differ in achievement, and chi-square tests indicated no statistically significant differences in the distribution of background characteristics (*p* values > .05). Hence, these findings suggest that both groups were mostly, although not fully, similar. Differences between the two groups were therefore accounted for in subsequent analyses.

<TABLE 1 HERE>

3.1 Descriptive statistics and correlations

Table 1 shows the descriptive statistics of the variables of the present study for the total sample and separately for gifted and non-gifted students. According to teacher ratings, teachers provided gifted students with more autonomy support and less structure compared to non-gifted students. Furthermore, gifted students reported significantly more competence satisfaction. The values of Cohen's *d* (Cohen, 1988) suggest that the significant differences in need support and need satisfaction can be interpreted as medium-sized effects. These differences between gifted and non-gifted students are further explored in subsequent analyses, taking into account gender and achievement as covariates.

Regarding the third research question on differences in motivation, it was found that gifted students reported more intrinsic regulation, less introjected and external regulation, more amotivation, and more behavioural engagement compared to non-gifted students. These statistically significant differences in motivation can be interpreted as small-sized differences.

The intraclass correlations (*ICCs*) are also included in Table 1. The ICCs of need support, need satisfaction, and student motivation indicated that more variance was situated at the student level

than at the class level, demonstrating substantial variation within classes. The ICCs for need support were much higher than for the other variables, especially for autonomy support and involvement. This was to be expected due to the fact that different teachers distributed these ratings.

Table 2 shows the correlations between the variables of the present study. Note that the correlations involving teacher-provided need support only included the subsample (N = 729), whereas the other correlations refer to the full sample. As expected, giftedness was positively correlated with achievement. Moreover, aligning with the results of Table 1, giftedness was positively associated with teacher-provided autonomy support, students' competence satisfaction, intrinsic regulation, amotivation, and behavioural engagement, and negatively with teacher-provided structure and introjected and external regulation.

Furthermore, the direction of the correlations between teacher-provided need support, need satisfaction, and other variables were mostly in line with SDT. However, contrary to SDT assumptions, teacher-provided structure was negatively related to student-perceived need satisfaction and behavioural engagement. Notably, measures of student-perceived need satisfaction were more strongly correlated with motivation than teacher ratings of need support. This makes sense as student-perceived need satisfaction is closest to how students psychologically respond to student-teacher interactions (Deci, 1975). In addition, shared response bias might have contributed to the higher correlations between student-rated constructs.

<TABLE 2 HERE>

3.2 Differences between gifted and non-gifted students in teacher-provided need support

Table 3 shows the results of the multivariate analyses concerning differences between gifted and non-gifted students in teacher-provided need support. Model 1 only included the covariates as predictors. In Model 2, giftedness was added as a predictor to examine whether students who are suspected or diagnosed as gifted received more autonomy, structure, or involvement according to their teachers. In Model 3, the suspicion of giftedness was added as an additional predictor to examine whether the associations between giftedness and need support differed for students suspected and certified to be gifted. The final model (Model 3) had good fit to the data, $\chi^2(9) = 8.143$, $p = .520$; RMSEA = .000; CFI = 1.000; SRMR = .030.

<TABLE 3 HERE>

Concerning teachers' provision of *autonomy support*, the results of Model 1 reveal that teachers provided more autonomy support to girls compared to boys and to students with higher achievement in reading comprehension and mathematics. Next, giftedness was added as a predictor in Model 2 and the suspicion of giftedness was added in Model 3. Because this predictor was not statistically significantly associated with autonomy support, the results of Model 2 and Model 3 were similar and only Model 3 was included in Table 3. The results indicate that, even after taking into account students' gender and academic achievement, teachers provided gifted students with more autonomy support compared to non-gifted students ($b = .34$; $p = .011$). The corresponding standardized coefficient was .12, suggesting a small effect. Note that the change in explained variance ($\Delta R^2 = .01$) also suggests a very small effect. The results of Model 3 furthermore indicate that there was no difference in autonomy support between students certified and suspected to be gifted.

With regard to *structure* (to support the need for competence), the results of Model 1 suggested that teachers provided less structure to high achieving students. There was no statistically significant association between giftedness and structure in Model 2. After adding the suspicion of giftedness in Model 3, the coefficient for giftedness became significant ($b = .84$; $p = .031$), indicating that as a

whole, gifted students received more structure from their teacher. Note that the *t*-test previously reported in Table 1 suggested that teachers provided gifted students with *less* structure than non-gifted students. Hence, the results of these subsequent analyses suggested that this difference in the provision of structure was due to differences in achievement between gifted and non-gifted students rather than being caused by being considered gifted by the teacher. Moreover, the suspicion of giftedness was negatively associated with structure (B = -1.16; p = .004). Hence, students suspected to be gifted received less structure from their teacher than students with a certified giftedness status. The estimated marginal means after taking into account prior achievement suggested that students who are suspected to be gifted received less structure (M = 2.63, SE = .12) than students certified as gifted (M = 3.21, SE = .14) as well as similarly achieving students without a certified status or suspicion of giftedness (M = 3.07, SE = .05). Adding giftedness and the suspicion of giftedness as a predictor to the model explained an additional 2% of the variance in structure, suggesting a small effect.

Lastly, the results of Model 1 indicate that only gender was a significant predictor of *involvement*, with teachers reporting higher levels of involvement with girls than with boys. Because the suspicion of giftedness, which was added in Model 3, was not statistically significantly associated with involvement, the results of Model 2 and 3 were similar and only Model 3 was included in Table 3. The findings indicated that giftedness was not a statistically significant predictor of involvement. Hence, teachers reported equally high levels of involvement with gifted and non-gifted students.

3.3 Differences between gifted and non-gifted students in perceived need satisfaction

Table 4 shows the results of multivariate analyses regarding differences between gifted and non-gifted students in need satisfaction. A similar procedure was followed as in the previous analyses. Because the suspicion of giftedness was not statistically significantly related to any of the dependent variables, it was excluded from the model. The final model (Model 2) had good fit to the data, χ^2 (10) = 8.571, p = .573; RMSEA = .000; CFI = 1.000; SRMR = .019.

<TABLE 4 HERE>

The results indicated that girls and higher achieving students experienced higher levels of *autonomy satisfaction*. Giftedness was not associated with autonomy satisfaction after controlling for these variables (and also not in the bivariate analyses, see Table 1), indicating that gifted and non-gifted students experienced similar levels of autonomy satisfaction.

With regard to *competence satisfaction*, the findings indicated that girls reported less competence satisfaction than boys. Additionally, higher achieving students reported higher levels of competence satisfaction. The results of the final model showed that giftedness was a statistically significant predictor of competence satisfaction (b = .13; p = .003). Hence, gifted students felt more competent than non-gifted students, even after taking into account background characteristics and prior achievement. The corresponding standardized coefficient was .04, suggesting a small effect and adding this predictor only explained an additional 0.1% of variance in competence satisfaction.

Neither grade, gender, nor achievement were significantly associated with *relatedness with classmates*. In Model 2, giftedness was found to be a statistically significant negative predictor of relatedness with classmates (b = -.13; p = .047), suggesting that gifted students felt less related to their classmates than non-gifted students. The corresponding standardized coefficient was -.04, suggesting a small effect size and adding this predictor only explained an additional 0.2% of the variance in relatedness with classmates.

Lastly, with regard to *relatedness with the teacher*, the results indicate that students with higher achievement in reading comprehension experienced more relatedness with their teacher, whereas students with higher achievement in mathematics reported lower levels of relatedness with their teacher. Giftedness was not a statistically significant predictor of relatedness with the teacher.

3.4 Associations between need satisfaction and motivation for gifted and non-gifted students

To examine whether relations between need satisfaction and motivation were similar for gifted and non-gifted students, multigroup path analyses were performed. First, a model was estimated in which all associations between need support, need satisfaction, and motivation were allowed to differ between gifted and non-gifted students. Model fit indices indicated that this constrained model fitted

the data well ($\chi^2(64) = 149.415$, $p < .001$; RMSEA = .037; CFI = .992; SRMR = .039). Imposing equality constraints did not significantly worsen model fit. The model with all parameters constrained had good fit to the data, $\chi^2(116) = 185.585$, $p < .001$; RMSEA = .025; CFI = .993; SRMR =.041. The final model, in which non-significant paths were set to zero fitted the data well, $\chi^2(134) = 218.759$ $p = <.026$; RMSEA = .026; CFI = .992, SRMR = .045. These findings indicate that associations between need support, need satisfaction, and student motivation did not significantly differ between gifted and non-gifted students. This model is depicted in Figure 1.

<< FIGURE 1 HERE >>

Figure 1. Unstandardized estimates of the of the two-group model (gifted and non-gifted students).
Note. Non-significant paths, covariates, error terms, and covariances are not depicted.

The findings presented in Figure 1 indicate that autonomy support and involvement were positively associated with various aspects of need satisfaction. Structure, however, was negatively associated with need satisfaction. Furthermore, aligning with expectations, the findings indicate that need satisfaction was positively associated with intrinsic, identified, introjected regulation, and behavioural engagement, and negatively with external regulation and amotivation. The corresponding standardized estimates indicated small to medium effect sizes for the relations between need support and need satisfaction and between need satisfaction and motivation. One finding that deviates from our expectations is the negative, yet small-sized association between relatedness satisfaction with classmates and intrinsic regulation.

With bootstrapping, we also tested the significance of indirect. Results suggested that need satisfaction mediated the associations between need support and motivation, although effect sizes of the indirect paths were small. Adding direct paths between teachers' autonomy support and student motivation did not improve model fit, suggesting full mediation. These findings were also similar for gifted and non-gifted students. The standardized estimates, associations that are not depicted (relations

with the covariates and covariances), and significant indirect paths are reported in the online supplementary materials.

3.4.1 Three-group model. To account for differences between students suspected to be gifted and certified as gifted, a three-group model was also estimated with groups being students certified as gifted, students suspected to be gifted, and non-gifted students. A similar statistical procedure was followed to test for differences between groups. The final model included one unconstrained path. For students certified as gifted, there was a statistically significant positive association between competence satisfaction and amotivation (b = .31, p < .001), whereas this relation was not significant for non-gifted students and students suspected to be gifted. This finding indicates that a higher level of competence satisfaction was associated with more amotivation for students certified as gifted, but not for both other groups. All other relations were similar for the three groups and mostly resembled the findings of the two-group model (see online supplementary materials for the full results). The final model fitted the data well, $\chi^2(236) = 501.254$, $p < .001$; RMSEA = .042; CFI=.976; SRMR = .066.

4. Discussion

Students' motivation can be triggered when the learning context satisfies students' basic psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 1985). To increase our understanding of how teachers support gifted students motivation in regular classes, the first aim of this study was to examine whether teachers reported equal levels of need support for gifted and non-gifted students, and whether gifted students experienced similar levels of need satisfaction compared to their non-gifted classmates, and to examine motivational differences between gifted and non-gifted students. Furthermore, to gain insight into how motivation of gifted students can be fostered in regular classrooms, the second aim of this study was to examine whether the different dimensions of need support and need satisfaction were as motivating for gifted students as they have been found to be for to non-gifted students (Stroet et al., 2013). The present study contributes to research on motivation of gifted students by showing several interesting, albeit mostly small-sized, differences between gifted

and non-gifted students in teachers' provision of need support, and students' perceptions of need satisfaction, and motivation, and by showing that need satisfaction is equally motivating for gifted students as it is for non-gifted students. Below, the findings are discussed in further detail.

In line with research among general classroom samples (Stroet et al., 2013), the findings of the present study indicate that autonomy support and involvement by the teacher can promote gifted students' need satisfaction and thereby the quality of their motivation. This may subsequently also help to prevent underachievement in gifted students. The strength of these relations was similar for gifted and non-gifted students. These findings suggest that gifted and non-gifted students do not differ in need strength, aligning with the idea of universality of needs (Chen et al., 2015). However, it was also found that gifted students did not experience a higher level of autonomy satisfaction than non-gifted students, even though teachers reported a somewhat higher degree of autonomy support for gifted students. This could in fact suggest a higher need for autonomy among gifted students, meaning that to satisfy gifted students' need for autonomy, they need to be offered more autonomy by their teachers compared to other students. Additional research could shed more light on this question by testing whether gifted and non-gifted students differ in need strength.

In the present study, we distinguished between teachers and classmates as distinct sources of relatedness. Gifted students were found to report similar levels of relatedness with the teacher and somewhat lower levels of relatedness with classmates compared non-gifted students. Nevertheless, gifted students still reported a relatively high level of relatedness with both teachers and classmates. Contrary to expectations, relatedness with classmates was not found to be associated with the quality of gifted or non-gifted students' motivation for school. Relatedness with the teacher on the other hand, was found to contribute to the quality of gifted and non-gifted students' motivation for school. Hence, these findings highlight the importance of differentiating between the teacher and classmates as different sources of relatedness satisfaction which affect students' motivation in different ways. From a more practical perspective, these findings indicate that supporting positive teacher-student relationships can be an effective way to maintain or enhance the quality of students' motivation for school, for gifted students as well as for their classmates.

Concerning structure, the findings indicated that, on overage, higher performing students received less help and guidance from their teachers than lower performing students, which aligns with previous research that indicates that teachers offer more help and guidance to lower-ability students (e.g. Deunk et al., 2018). In heterogeneous classrooms, it seems likely that lower-ability students experience more challenge in their schoolwork. Accordingly, these students may have a higher need for structure compared to gifted students in order to be able to successfully work on their tasks. This could be an indication that the materials and tasks in these classrooms are not optimally challenging for gifted students. If gifted students were in a sufficiently paced classroom or working on materials that are challenging to them, teachers would also need to provide them with structure. Furthermore, students who were suspected to be gifted received less structure from their teacher than students classified as being gifted or students who were also high achieving, but not suspected or classified as gifted. Those students who were officially classified as gifted have mostly been examined by a licensed psychologist. It may be that these students have encountered specific challenges in the classroom which may have prompted an examination by a licensed psychologist. This group may for example contain more students with social-emotional or behavioural difficulties or more 'twice exceptional' students (Wang & Neihart, 2015) compared to the students who were suspected to be gifted. This might explain why teachers perceive a higher need for structure for students who were classified as being gifted compared to the group of students suspected to be gifted.

According to SDT, the provision of structure supports students' need to feel competent (Deci & Ryan, 1985). Yet, even though gifted students on average received less structure than equally high achieving classmates, they reported higher levels of competence satisfaction. This could imply that gifted students do not only feel more competent because they show higher achievement than their classmates, but that being considered gifted by their teachers may by itself also contribute to their feelings of competence. In their work, Marsh, Kong, and Hau (2000) described the 'reflected-glory effect', stating that feelings of competence may be enhanced by membership of a group that is considered successful. Accordingly, the gifted students in the present study may have felt more competent because their teacher considered them to be gifted. It could be that teachers explicitly communicated this to the students or it could be that these students got an adapted curriculum or were

given access to special services for gifted students, such as pull-out groups, which can make these students aware of their 'special status', thereby boosting their feelings of competence. The additional results from the three-group model suggest that this may have a negative 'side effect'. That is, a high level of competence satisfaction was associated with higher levels of amotivation among students classified as gifted. Prior studies indicate that under certain conditions, high competence beliefs can have negative effects. One of these conditions includes overconfidence (Stone, 1994; Vancouver, Thompson, Tischner, & Putka, 2002). It could be that students who are officially classified as gifted become so confident in their abilities, that they may feel they waste their time in school.

The conceptualization of structure in the present study may also account for the finding that high-achieving students, including gifted students, received less structure from their teachers. Our measurement of structure aligned with current SDT-notions and focused on teachers' provision of help and guidance during learning (e.g. Jang et al., 2010; Stroet et al., 2013). However, even though this appears to be amongst the most prominent features of structure in SDT, structure is also considered a multifaceted concept, which also constitutes adjusting feedback and teaching strategies to the level of the student (Skinner & Belmont, 1993). This latter dimension does not receive as much attention in research on need-supportive teaching but may be especially relevant when it comes to gifted students. These students may not necessarily need *more* help or guidance. Instead, according to research on educational provisions for gifted students (Little, 2018), they need materials, instructions, guidance, and feedback to be adapted to their ability level. Hence, the concept of scaffolding (Van de Pol, Volman, & Beishuizen, 2010) may present a more suitable way of conceptualizing structure. Scaffolding is defined as support provided by the teacher that is adapted to the current level of the student's performance (Van de Pol et al., 2010). If the definition and conceptualization of structure would shift more toward scaffolding, it would align better with the notion that in heterogeneous classrooms structure can take on different forms for different students. Moreover, the results indicated that teacher-provided structure was negatively related to student-perceived need satisfaction and the quality of students' motivation. The negative relation between structure and autonomy support (r = -.25) suggests that teachers provide structure in controlling, rather than in autonomy-supportive ways

(Haerens et al., 2015; Jang et al., 2010). It could be that a different conceptualisation of structure, as discussed above, may yield different findings.

The findings also indicated interesting differences between gifted and non-gifted students in motivation. In line with previous research (e.g. Gottfried & Gottfried, 1996), gifted students reported higher levels of intrinsic motivation. Interestingly, they also reported higher levels of amotivation, showing the importance of also considering less adaptive dimensions of motivation. Hence, gifted students do seem to enjoy and value learning, but at the same time, they may experience a lack of interest in school. This might explain why a lack of motivation has often been mentioned as a frequently occurring problem for gifted students (Rubenstein, Siegle, Reis, McCoach, Burton, 2012) even though findings on intrinsic motivation alone do not support this assumption. Given the potential harmful consequences of amotivation (e.g, Ntoumanis, 2001), these findings underline the importance of including the full scope of motivation in research on (gifted) students' motivation, and the importance of examining how teacher can support gifted students' motivation.

4.1 Limitations and future research

Several limitations of the present study are worth noting. First, given the cross-sectional nature of the data, the direction of causality cannot be established. Longitudinal research could help to unravel the direction of causality. Second, students were considered gifted based on nominations by their teacher. Additional diagnostic sources would have strengthened the validity of our conclusions. Then again, our operationalization aligns with educational practice in which identification procedures also tend to be varied. Moreover, the present study focused on how teachers support the needs of gifted students. For the purpose of the present study, it therefore seems most relevant to focus on students who they consider to be gifted. Third, the schools in the present study all participated in the educational lab POINT, which focuses specifically on gifted and talented students. The educational practices at these schools may be more adapted to the needs of gifted students compared to other schools. Fourth, need support was assessed with single items. That made it possible to include a student-specific measure of need support, as it reduced the time investment for teachers. However, a scale consisting of multiple items could provide a better assessment of these constructs. Fifth, although the present study had a

relatively large sample of gifted students, CFA and SEM analyses, are ideally conducted with samples of over 200 students (e.g., Brown, 2015; Kline, 2015; Savalei & Bentler, 2005; Yuan & Bentler, 2000). The sample of gifted students in the analyses was slightly smaller, which might have impacted the robustness of the results, especially for the analysis involving the three-group model in which the gifted students were divided into two smaller groups. Finally, educational provisions for gifted students, such as pull-out programs (e.g. Hornstra et al., 2017) or enrichment in their regular class, were beyond the focus of the present study, as it focused on how teachers supported the needs of gifted students in their regular interactions with these students. Future research could investigate how different educational provisions may affect gifted students' need satisfaction and motivation.

4.2 Conclusions

The present study was among the first to compare the level of and relations between need support, need satisfaction, and motivation for gifted and non-gifted students. In doing so, this study suggested promising avenues of how the quality of gifted students' motivation can be fostered in regular education classrooms. The findings indicated that especially autonomy support and involvement by teachers are positively associated with high-quality motivation in gifted students.

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Table 1. *Descriptive statistics of study variables for the total group, and separately for non-gifted and gifted students.*

	Total group				Non-gifted students			Gifted students				
	N	*M*	*SD*	*ICC*	*N*	*M*	*SD*	*N*	*M*	*SD*	*t-test*	*d*
Teacher-provided need support												
Autonomy support	721	3.31	1.09	.41	562	3.20	1.05	159	3.69	1.16	5.02***	.46
Structure	727	3.05	1.22	.17	568	3.19	1.20	159	2.55	1.20	-5.90***	.53
Involvement	729	4.36	0.84	.42	570	4.38	0.75	159	4.26	0.85	-1.70	.16
Students' need satisfaction												
Autonomy satisfaction	1898	3.21	0.55	.06	1705	3.21	0.55	193	3.28	0.56	1.65	.13
Competence satisfaction	1898	3.61	0.65	.03	1697	3.62	0.63	188	3.97	0.62	7.18***	.56
Relatedness (classmates)	1898	4.04	0.67	.05	1699	4.05	0.73	190	3.95	0.76	-1.82	.14
Relatedness (teacher)	1896	3.94	0.68	.13	1703	3.94	0.68	193	3.92	0.64	-0.44	.03
Motivation and engagement												
Intrinsic regulation	1880	4.01	0.70	.04	1690	4.00	0.70	190	4.16	0.66	3.16**	.24
Identified regulation	1878	4.32	0.56	.03	1686	4.32	0.56	192	4.29	0.57	-0.64	.05
Introjected regulation	1879	3.66	0.76	.05	1687	3.68	0.76	192	3.49	0.75	-3.27**	.25
External regulation	1864	2.75	0.97	.11	1674	2.76	0.99	190	2.60	0.84	-2.46*	.19
Amotivation	1864	1.81	0.82	.04	1691	1.80	0.82	173	1.93	0.77	2.01*	.17
Behavioural engagement	1892	4.00	0.51	.04	1699	3.99	0.51	193	4.08	0.51	2.29*	.18

Note. $p < .05$. * $p < .05$ level (2-tailed); ** $p < .01$ level (2-tailed); *** $p < .001$ level (2-tailed).

Table 2. *Correlations between the variables of the present study.*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
Giftedness and covariates																	
1. Gifted																	
2. Gender (girl)	-.09***																
3. Grade (school year)	.00	-.06**															
4. Reading comprehension	.32***	.07**	-.01														
5. Mathematics	.29***	-.17***	.01	.50***													
Teacher-provided need support																	
6. Autonomy support	.18***	.08*	.09*	.28***	.29***												
7. Structure	-.21***	.05	-.05	-.35***	-.37***	-.25***											
8. Involvement	-.06	.18***	-.11**	.04	-.05	.16***	.01										
Students' need satisfaction																	
9. Autonomy satisfaction	.04	.11***	.06*	.14***	.09***	.10*	-.16***	.16***									
10. Competence satisfaction	.16***	-.19***	.02	.23***	.31***	.19***	-.35***	.03	.35***								
11. Relatedness (classmates)	-.04	-.01	.01	.04	.04	.11**	-.12**	.07	.30***	.29***							
12. Relatedness (teacher)	-.01	.02**	.00	.04	-.01	.12**	-.06	.29***	.41***	.24***	.35***						
Motivation and engagement																	
13. Intrinsic regulation	.07**	.01	-.09***	.10***	.08**	.07	-.06	.13***	.46***	.36***	.19***	.37***					
14. Identified regulation	-.02	.04	-.02	.00	.01	.05	.01	.13**	.37***	.25***	.24***	.39***	.55***				
15. Introjected regulation	-.08**	-0.02	-.18***	-.06**	-0.02	-.09*	0.04	.08*	.17***	.25***	.16***	.26***	.37***	.42***			
16. External regulation	-.05*	-.10***	-.27***	-.17***	-.15***	-.12**	.10**	-.04	-.37***	-.16***	-.11***	-.17***	-.17***	-.16***	.14***		
17. Amotivation	.05*	-.14***	-.04	-.08**	-.01	-.06	.03	-.12**	-.45***	-.14***	-.21***	-.34***	-.38***	-.45***	-.12**	.33**	1
18. Behavioural engagement	.05*	.12***	-.04	.13***	.10***	.13***	-.15***	.21**	.39***	.39***	.23***	.30***	.40***	.37***	.21***	-.17***	-.30***

Note. * $p < .05$ level (2-tailed); ** $p < .01$ level (2-tailed); *** $p < .001$ level (2-tailed).

Table 3. *Unstandardized estimates for the path model predicting teacher-provided need support from the covariates and giftedness.*

	Autonomy support				Structure						Involvement			
	Model 1		Model 3		Model 1		Model 2		Model 3		Model 1		Model 3	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	3.05***	.09	2.99***	.10	3.25***	.07	3.25***	.07	3.27***	.08	4.22	.08	4.23***	.08
Grade	*ns*		*ns*		*ns*		*ns*		*ns*		*ns*			
Girl	.21**	.07	.22**	.08	*ns*		*ns*		*ns*		.26***	.06	.26***	.06
Reading comprehension	.16***	.04	.14**	.04	-.22***	.05	-.22***	.05	-.22***	.05	*ns*		*ns*	
Mathematics	.29***	.05	.25***	.05	-.38***	.06	-.39***	.06	-.35***	.06	*ns*		*ns*	
Gifted			.34*	.13			*ns*		.84*	.39			*ns*	
Suspicion			*ns*						-1.16**	.40			*ns*	
R^2	.13		.14		.18		.19		.20		.03		.03	
ΔR^2			.01				.01		.02				.00	

Note. ns = not significant at $p < .05$. * $p < .05$ level (2-tailed); ** $p < .01$ level (2-tailed); *** $p < .001$ level (2-tailed).

Table 4. *Unstandardized estimates for the path model predicting students' need satisfaction from the covariates and giftedness.*

	Autonomy satisfaction				Competence satisfaction				Relatedness - classmates				Relatedness - teacher			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept	-.06	.04	-.06	.04	.11**	.04	.09*	.04	-.01	.03	.01	.03	-.01	.05	-.01	.05
Grade	*ns*		*ns*		*ns*		*ns*		*ns*		*ns*		*ns*		*ns*	
Girl	.13***	.04	.13***	.04	-.20***	.04	-.20***	.04	*ns*		*ns*		*ns*		*ns*	
Reading comprehension	.07**	.03	.08***	.03	.11***	.02	.10***	.02	*ns*		*ns*		.07**	.02	.07***	.02
Mathematics	.08***	.02	.05*	.02	.20***	.02	.18***	.02	*ns*		*ns*		-.05*	.02	-.05	.02
Gifted			*ns*				.13***	.02			-.13*	.06			ns	
R^2	.02		.02		.10		.10		.00		.00		.00		.00	
ΔR^2																

Note. ns = not significant at $p < .05$. * $p < .05$ level (2-tailed); ** $p < .01$ level (2-tailed); *** $p < .001$ level (2-tailed).

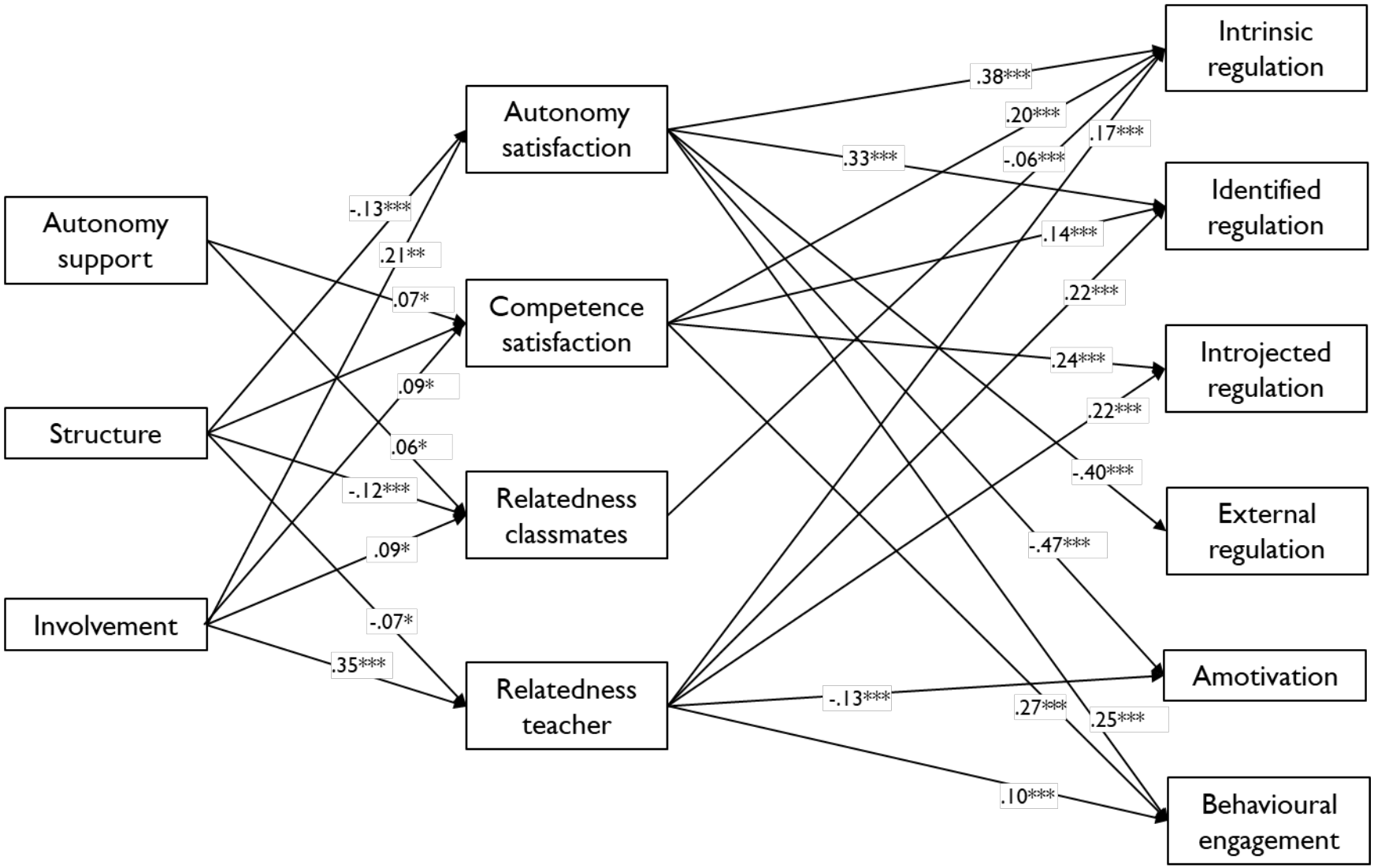

Figure 1. Unstandardized estimates of the two-group model (gifted and non-gifted students).
Note. Non-significant paths, covariates, error terms, and covariances are not depicted.