

Intrinsic and extrinsic school motivation as a function of age: the mediating role of autonomy support

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Abstract The main purpose of the present research was to investigate school intrinsic and extrinsic motivation, and amotivation as a function of age in a sample of 1,600 elementary and high school students aged 9–17 years. First, results revealed a systematic decrease in intrinsic motivation and self-determined extrinsic motivation from age 9 to 12 years, a slow stabilization until 15 years old, followed by an increase after that point. Second, non self-determined extrinsic motivation showed a decrease up to 12 years old and a slow stabilization after that point. Finally, amotivation was relatively low and stable from age 9 to 17 years. Of importance is that the present results also revealed that teacher autonomy support mediated the age-school motivation relationships. The present results underscore the importance of a better understanding of the mechanisms through which lower intrinsic motivation and self-determined extrinsic motivation in older students take place, eventually leading to appropriate interventions and optimal motivation in students of all ages.

Keywords Age · Motivation · Autonomy support · Self-determination theory

Much research has documented the role of intrinsic and extrinsic motivation in educational outcomes. For instance, intrinsic motivation (or engaging in the activity for its own sake) has been found to facilitate conceptual learning, performance, school

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enjoyment, and both intentions and actual school persistence, while extrinsic motivation (or engaging in an activity to obtain an outcome separate from the activity) has been typically found to undermine such outcomes (see [Cordova and Lepper 1996](#); [Deci et al. 1991](#); [Reeve et al. 2004](#); [Vallerand 1997](#)).

In light of these motivational outcomes, it would appear important to identify the factors that affect intrinsic and extrinsic motivation toward education as well as the psychological processes that underlie such effects. In that vein, one phenomenon that has started to emerge is the systematic linear decrease in intrinsic motivation toward education from elementary to high school. In the first study addressing this issue, [Harter \(1981\)](#) assessed the intrinsic motivation of slightly over 3,000 elementary and high school students from four US States. Results revealed that intrinsic motivation decreased from Grade 3 to Grade 9 (i.e., 8–14 years of age). These findings were replicated by Harter in another sample (see [Harter and Jackson 1992](#)). In these studies, the Intrinsic and Extrinsic Orientation Scale ([Harter 1981](#)) was used. This scale pits intrinsic against extrinsic motivation. Specifically, for each item, participants are provided with two possible responses, an intrinsic one and an extrinsic one. They must decide which of the options is most true for them. Thus, the 4-point scale assumes that intrinsic motivation and extrinsic motivation represent the two end-points of one continuum (i.e., a high level of one invariably leads to a low level of the other), and the two types of motivation are therefore not assessed independently.

One important consequence of the use of the Harter scale is that it is not clear from the above research ([Harter 1981](#); [Harter and Jackson 1992](#)) if it is intrinsic motivation that decreases or extrinsic motivation that increases from elementary to high school. In order to clarify the issue, [Lepper et al. \(2005\)](#) used a modified version of the Harter scale by separating the intrinsic from the extrinsic items. Using a cross-sectional design, and 8–14 year old students, Lepper et al. replicated the negative linear trend of intrinsic motivation over time. In the same vein, [Corpus et al. \(2009\)](#) assessed students' intrinsic and extrinsic motivational orientations with scales from [Lepper et al. \(2005\)](#). These authors also showed in a sample of students from eight schools that intrinsic motivation decreased from Grade 3 to Grade 8 (i.e., 8–13 years of age). Furthermore, using a longitudinal design and two different motivation scales (including one that assesses intrinsic and extrinsic motivation separately), [Gottfried et al. \(2001\)](#), as well as [Otis et al. \(2005\)](#), replicated the negative linear decrease in intrinsic motivation with students aged 9–17 and 13–15 years, respectively. Of additional interest is that in the Gottfried et al. study, the linear decrease stopped at age 16. In fact, age 17 students had on average higher intrinsic motivation scores than the 16-year old students, although the scores of the 17 year-old students were still lower than those of the younger age groups.

The picture with extrinsic motivation is less clear. Only three studies have looked at the evolution of extrinsic motivation at school as a function of age. In the above-cited study, using extrinsic items created from the Harter scale, [Lepper et al. \(2005\)](#) did not find any linear effects. In contrast, findings from [Corpus et al. \(2009\)](#) revealed a small decrease in extrinsic motivation as a function of grade level, especially among the third- through fifth-grade students. Finally, in the Otis et al. study, results revealed that all forms of extrinsic motivation decreased from age 13 to 15 years. Although the differences in amotivation (the relative absence of motivation be it intrinsic or extrinsic;

see [Deci and Ryan 1985](#); [Vallerand 1997](#)) were significant, very little change took place as a function of age (scores varied between 1.48 and 1.77 on a 5-point scale).

These divergent findings with respect to extrinsic motivation might be due to the assessment of extrinsic motivation. Different types of extrinsic motivation as posited by Self-Determination Theory ([Deci and Ryan 2000, 2008](#); [Ryan and Deci 2000](#)) were not considered in the studies conducted by [Lepper et al. \(2005\)](#) and [Corpus et al. \(2009\)](#), as all extrinsic items would appear to pertain only to non self-determined extrinsic motivation (see below). [Otis et al. \(2005\)](#) used the Academic Motivation Scale (AMS; [Vallerand et al. 1992, 1993](#)) to examine changes in intrinsic motivation and various types of extrinsic motivation during the transition from junior to senior high school. In addition to intrinsic motivation, the AMS also assesses different types of extrinsic motivation as posited by Self-Determination Theory ([Deci and Ryan 2000](#)), including forms of extrinsic motivation that have been referred to as self-determined extrinsic motivation (i.e., going to school out of personal choice) and non self-determined extrinsic motivation (i.e., going to school out of internal or external pressure; see [Vallerand 1997](#)). Future research should thus address how both forms of extrinsic motivation may differ as a function of age. It is also possible that the social context and characteristics of the participants may contribute to the diverse sets of findings. In sum, further research is needed to investigate differences in school extrinsic motivation as a function of age and the social context.

Recent research has started to attempt to empirically uncover the nature of the processes responsible for changes in intrinsic and extrinsic motivation. For instance, the [Lepper et al. \(2005\)](#) study has tried to determine if social desirability is responsible for the age effects on motivation. Results revealed that it did not. [Gottfried et al. \(2009\)](#) showed that the more the parents used task-intrinsic practices, the less children showed a decrease in intrinsic motivation. These authors did not assess extrinsic motivation. Finally, [Corpus et al. \(2009\)](#) showed that positive fall-to-spring changes in intrinsic and extrinsic motivation were predicted by an increase in students' perceptions of the school context as being mastery-oriented and performance-oriented, respectively.

One other factor that could mediate the age effect on school motivation is the social context prevalent in children's education domain. A key social factor deals with the autonomy support ([Deci and Ryan 1985](#)) that adults provide children. Autonomy support is said to be present when parents or teachers take the children's perspective and provide opportunities for choice and participation in decision making, while minimizing the use of pressure ([Grolnick and Ryan 1989](#)). Much research has shown that while autonomy support from teachers and parents fosters intrinsic motivation and self-determined forms of extrinsic motivation, it also decreases non self-determined extrinsic motivation and amotivation (e.g., [Grolnick and Ryan 1989](#); [Guay and Vallerand 1997](#); [Vallerand et al. 1997](#)). Furthermore, autonomy support and provision of choice from teacher and parents seem to decrease as a function of age, while there is an increase in teacher control in the classroom (see [Eccles 1993](#), for a review). This decrease in autonomy support in high school comes at a time when students feel that they should be getting more, rather than less, say in their schooling ([Eccles and Midgley 1989](#)) thereby exacerbating even more the loss in autonomy and consequently the potential loss in intrinsic motivation and self-determined extrinsic motivation. This reasoning

suggests that teacher and parental autonomy support may represent key mediators of the changes in school motivation that take place as students progress in their schooling.

The above research leads to a number of conclusions. First, while the linear decrease in intrinsic motivation as a function of age seems robust, it is not clear if the decrease continues progressively or if it levels off or even if intrinsic motivation increases at some later point (16–17 years of age) as was found in the [Gottfried et al. \(2001\)](#) study. Second, the picture with extrinsic motivation is far from clear with one study finding no change ([Lepper et al. 2005](#)), another finding some minimal change ([Corpus et al. 2009](#)), and another one finding significant decreases in both self-determined and non self-determined forms of extrinsic motivation between the age of 13 and 15 years ([Otis et al. 2005](#)). Third, while little change seems to take place in amotivation in high school ([Otis et al. 2005](#)), no research to date has looked at amotivation as a function of age at the elementary school level. Finally, little is known on the mediators of the age-school motivation relationships. One potential mediator worth investigating is teacher and parental autonomy support ([Eccles 1993](#); [Grolnick and Ryan 1989](#); [Vallerand et al. 1997](#)).

1 The present research

The purpose of the present research was to address the above issues with 1,600 students from early elementary levels to the end of high school in the Province of Quebec, ranging from 9 to 17 years of age. Specifically, a first goal of the present research was to assess intrinsic and extrinsic motivation, and amotivation toward school of children aged from age 9 to 17 years. In line with past research ([Harter 1981](#); [Harter and Jackson 1992](#); [Gottfried et al. 2001, 2009](#); [Lepper et al. 2005](#); [Otis et al. 2005](#)), it was also hypothesized that a linear decrease would be found from the age of 9–15 years. However, in line with the findings from the [Gottfried et al. \(2001\)](#) study, an increase in intrinsic motivation was expected for the 16–17 year old students (the last 2 years of high school in the Province of Quebec) relative to the 14–15 year old students. Thus, in addition to a negative linear trend, a positive quadratic trend was also expected (i.e., inverted U shaped relationship). Similarly, because self-determined extrinsic motivation entails a relatively high level of inherent autonomy, it was hypothesized that it would yield results similar to intrinsic motivation (negative linear and positive quadratic trends). In line with the findings of [Otis et al. \(2005\)](#), it was predicted that non self-determined extrinsic motivation would only show a linear negative trend. Finally, also in line with the findings of [Otis et al. \(2005\)](#), amotivation was expected to be low and relatively stable across age groups.

A second purpose of the present research was to test the role of teacher and parental autonomy support as a potential mediator of the age effect on school motivation. In light of past research on the role of autonomy support in intrinsic motivation (see [Mageau and Vallerand 2003](#), for a review), we hypothesized that means in autonomy support as a function of age would display similar patterns as those in school intrinsic and self-determined extrinsic motivation. Thus, it was expected that both a negative linear trend and a positive quadratic trend would be obtained for autonomy support from teachers and both parents (see also [Eccles 1993](#)). Furthermore, results

from structural equation modeling analyses should also show that teacher and parental autonomy support mediate the age-school motivation relationship. Specifically, age and autonomy support should be related in a negative linear trend and/or a positive quadratic trend, and in turn, autonomy support from teacher and parents should be positively related to intrinsic motivation and self-determined extrinsic motivation, but negatively related to non self-determined extrinsic motivation and amotivation (see [Deci and Ryan 2000](#); [Vallerand 1997](#), for reviews). Finally, a final purpose of this research was to assess the relative contribution of teacher and both parents as mediators of the age-school motivation relationship. In line with research on the relative effects of teacher versus parental autonomy support on intrinsic and self-determined extrinsic motivation, it was expected that teacher autonomy support would have a stronger relationship with students' motivation than mother autonomy support (e.g., [Guay and Vallerand 1997](#); [Vallerand et al. 1997](#)), that, in turn, was expected to be more strongly related to children's school motivation than father autonomy support (e.g., [Grolnick and Ryan 1989](#)).

2 Method

2.1 Participants and procedure

Participants were 1,606 students aged between 9 and 17 years ($M = 13.01$ years; $SD = 2.61$ years) from different schools in the area of Quebec City, Canada. The present sample contained approximately equal numbers of girls ($n = 810$) and boys ($n = 793$), with three students who did not specify their gender. Students filled out questionnaires at school during class time and did not receive extra credit for participation in the study. In line with past research (e.g., [Harter 1981](#); [Otis et al. 2005](#)), each item was read by the experimenter for the younger students (i.e., those aged 9–11 years) to ensure proper understanding of the items.

2.2 Measures

2.2.1 School motivation

Students' motivation toward school activities was assessed with a scale adapted from [Ryan and Connell \(1989\)](#) and [Vallerand and O'Connor \(1991\)](#). We decided to create this scale in order to have all students complete the same scale and to make it easy enough for young children (i.e., age 9–11 years) to complete. In line with [Ryan and Connell \(1989\)](#), this scale contains three different types of school activities (i.e., going to school, doing one's homework, and listening to the teacher in class). For each activity, students are asked why they typically engage in the activity. In line with [Vallerand and O'Connor \(1991\)](#), there are four reasons (items) reflecting intrinsic motivation (“*For the pleasure of doing it*”), self-determined extrinsic motivation (“*Because I have chosen to do it myself for my own good*”), non self-determined extrinsic motivation (“*Because it is what I am supposed to do*”), and amotivation (“*I don't know why, I really don't see what it can bring me*”). Answers are given to each of the reasons

Table 1 Means, standard deviations, standardized factor loadings from the confirmatory factor analysis on motivation items

Item	M	SD	Factor 1	Factor 2	Factor 3	Factor 4
1. Intrinsic motivation item 1	2.44	1.43	.83			
2. Intrinsic motivation item 2	2.68	1.43	.87			
3. Intrinsic motivation item 3	2.61	1.42	.86			
4. Self-determined extrinsic motivation item 1	4.40	0.97		.77		
5. Self-determined extrinsic motivation item 2	4.43	0.99		.79		
6. Self-determined extrinsic motivation item 3	4.39	1.00		.80		
7. Non self-determined extrinsic motivation item 1	3.64	1.38			.83	
8. Non self-determined extrinsic motivation item 2	3.79	1.36			.88	
9. Non self-determined extrinsic motivation item 3	3.67	1.38			.83	
10. Amotivation item 1	1.56	1.00				.78
11. Amotivation item 2	1.50	0.95				.84
12. Amotivation item 3	1.60	1.01				.81

on a 5-point Likert scale ranging from “*Strongly disagree*” (1) to “*Strongly agree*” (5). Scores for the three different activities are added for each form of motivation. The sample was randomly split into half. With the first half of the sample, we first conducted an exploratory factor analysis using principal components analysis with varimax rotation. Four factors with eigenvalues higher than 1 (3.42, 2.37, 2.23, and 1.18) were retained, explaining 77% of the variance. Factor loadings ranged from .86 to .91 on the intrinsic motivation factor, .82 to .85 on the self-determined extrinsic motivation factor, .87 to .88 on the non self-determined motivation factor, and .79 to .89 on the amotivation factor. Then, results of a confirmatory factor analysis conducted with the second random half of the sample revealed that the 4-factor model adequately reflected the data, $\chi^2(48, N = 803) = 152.42$, $p < .05$, CFI = .98, NNFI = .97, and RMSEA = .05. Standardized loadings were all significant and greater than .76 (see Table 1). Finally, Cronbach alphas ranged from .83 to .88.

2.2.2 Perceived autonomy support toward school activities

Students’ perceptions of autonomy support from their teachers were assessed using 8 items (e.g., “*My teachers generally give me the opportunity to make my own decisions*”; “*My teachers encourage me to be myself*”) adapted from Vallerand et al. (1993). The same 8 items were used to assess students’ perceptions of autonomy support from their mother and father, by changing the expression “*My teachers*” by “*My mother*” or “*My father*”. Participants responded to items on a 5-point Likert scale ranging from “*Strongly disagree*” (1) to “*Strongly agree*” (5). In line with what was done with the school motivation measure, the sample was randomly split into two halves. Results

of exploratory factor analyses with the first half of the sample revealed initial support for the structure of each of the three versions of the scale (autonomy support from the mother, father, and teachers). Specifically, an examination of the scree plot for the three versions of the scale showed clear discontinuity in the slope after one factor, suggesting that extracting one factor is appropriate (Tabachnick and Fidell 2007). Results supported the presence of one factor. For instance, for mother autonomy support, this factor had an eigenvalue of 4.28 and explained 54% of the variance of the items. Factor loadings ranged from .52 to .79. The one-factor structure of each version of this scale was then examined via confirmatory factor analyses with the second random half of the sample. Results yielded acceptable fit indices for all three versions of the scale: at least $\chi^2(20, N = 791) = 104.89, p < .05, CFI = .99, NNFI = .98,$ and $RMSEA = .07$. Furthermore, the Cronbach alphas were satisfactory, ranging from .89 to .91.

2.3 Data analysis

First, the relationships between students' age and school motivation (i.e., intrinsic motivation, self-determined extrinsic motivation, non self-determined extrinsic motivation, and amotivation) were examined. Second, students' perceptions of autonomy support from their teachers, mother, and father as a function of age was inspected. Finally, the mediating role of teacher and parental autonomy support in the age-school motivation relationships was explored.

All analyses were performed using structural equation modeling with EQS 6.1 (Bentler 1993). Usually, fit of the model to the data is examined using the chi-square test. A non significant chi-square indicates that the model was able to replicate suitably the sample covariance matrix. However, there are problems with relying solely on the chi-square test because this statistic is sensitive to the size of the correlations and to sample size (see Kline 2005). Moreover, some researchers (e.g., Tabachnick and Fidell 2007) have suggested using additional fit indices to further assess model fit: the Comparative Fit Index (CFI), the Bentler-Bonett Non-Normed Fit Index (NNFI), and the Root Mean Square Error of Approximation (RMSEA). In light of the present study's large sample size, we used the above fit indices when evaluating the fit of each model to the data. According to Kline (2005) and Tabachnick and Fidell (2007), the CFI and NNFI should be .90 or higher for acceptable model fit. Moreover, the RMSEA should be .06 or lower (Hu and Bentler 1999).

3 Results

3.1 Motivation as a function of age

Means, standard deviations, and correlations among all study variables appear in Table 2. Given that age was expected to be linearly and negatively but also quadratically and positively (i.e., inverted U shaped relationship) related to intrinsic and self-determined extrinsic motivation, age was centered and then squared to represent this quadratic trend in the hypothesized model (see Moosbrugger et al. 2009; Schumacker and Marcoulides 1998, for nonlinear effects in structural equation modeling).

Table 2 Means, standard deviations, and correlations among the study variables

Variables	M	SD	1	2	3	4	5	6	7	8
1. Age	13.01	2.61								
2. Intrinsic motivation	2.51	1.30	-.17**	.88						
3. Self-determined extrinsic motivation	4.33	0.91	-.05	.25**	.83					
4. Non self-determined extrinsic motivation	3.78	1.20	-.25**	-.05	-.08*	.87				
5. Amotivation	1.68	0.97	.01	-.03	-.40**	.15**	.84			
6. Teacher autonomy support	3.52	0.91	-.45**	.29**	.36**	.07*	-.19**	.89		
7. Mother autonomy support	4.16	0.78	-.31**	.14**	.29**	.07*	-.17**	.45**	.89	
8. Father autonomy support	3.90	0.94	-.31**	.14**	.23**	.03	-.11**	.42**	.57**	.91

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

Cronbach alphas of each subscale are presented on the diagonal

Items for motivation and autonomy support subscales are measured on a 5-point scale

The first model tested in the present study was composed of 2 observed (i.e., linear and quadratic age) and 4 latent variables with 3 indicators each (intrinsic, self-determined extrinsic, non self-determined extrinsic motivation, and amotivation). Five paths were specified: three between linear age and intrinsic, self-determined extrinsic, and non self-determined extrinsic motivation, and two between quadratic age and intrinsic and self-determined extrinsic motivation. Furthermore, covariance paths between linear and quadratic age and among motivation types were estimated. Results from Lagrange Multiplier (LM) tests suggested the addition of a path between quadratic age and non self-determined extrinsic motivation. Thus, a second model including this path was estimated. The model had an acceptable fit to the data, $\chi^2(df = 66, N = 1606) = 297.91$, $p < .05$, CFI = .97, NNFI = .96, RMSEA = .05.

The model appears in Fig. 1. Age was found to be linearly and negatively related to both intrinsic motivation ($\beta = -.13$) and non self-determined extrinsic motivation ($\beta = -.24$). However, age was not linearly related to self-determined extrinsic motivation ($\beta = -.01$). In addition, age was found to be quadratically and positively related to intrinsic motivation ($\beta = .19$), self-determined extrinsic motivation ($\beta = .06$), and non self-determined extrinsic motivation ($\beta = .06$). Results from LM tests suggested that no addition of any parameters could significantly improve model fit.

Furthermore, repeated contrasts were conducted to interpret the significant quadratic associations between students' age and intrinsic, self-determined extrinsic, and non self-determined extrinsic motivation. Results revealed that students' intrinsic and self-determined extrinsic motivation sharply decrease up to 12 years old, slowly stabilize until 15 years old, and increase after that point. In addition, results revealed that students' non self-determined extrinsic motivation sharply decreases up to 12 years old and slowly stabilizes after that point.

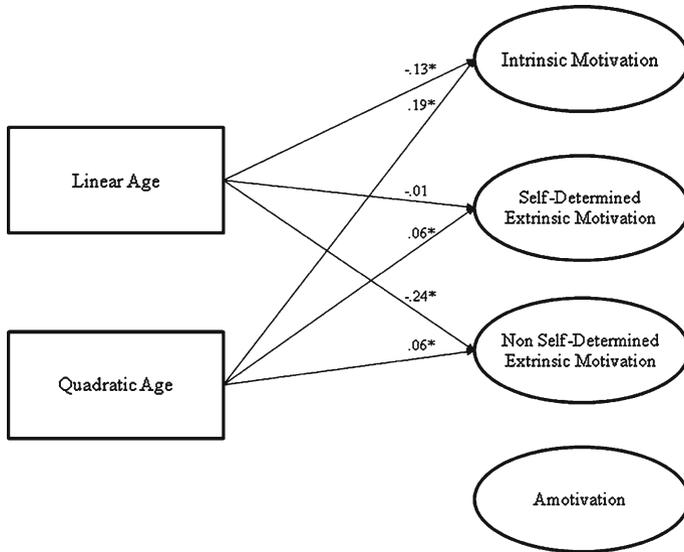


Fig. 1 School motivation as a function of linear and quadratic age. *Note.* The measurement model is not presented for sake of clarity. * $p < .05$

3.2 Autonomy support as a function of age

As above, age was centered and then squared to represent the hypothesized quadratic trend in the model. The second model tested in the present study was composed of 2 observed (i.e., linear and quadratic age) and 3 latent variables with 8 indicators each (teacher, mother, and father autonomy support). Six paths were specified: three between linear age and teacher, mother, and father autonomy support, and three between quadratic age and teacher, mother, and father autonomy support. Furthermore, covariance paths between linear and quadratic age as well as among teacher, mother, and father autonomy support were estimated. The model had an acceptable fit to the data, $\chi^2(df = 291, N = 1606) = 1988.40, p < .05, CFI = .90, NNFI = .90, RMSEA = .06$.

The model appears in Fig. 2. Age was found to be linearly and negatively related to teacher ($\beta = -.44$), mother ($\beta = -.32$), and father ($\beta = -.32$) autonomy support. In addition, age was found to be quadratically and positively related to only teacher autonomy support ($\beta = .12$). However, age was neither quadratically related to mother ($\beta = .04$) nor to father ($\beta = .03$) autonomy support. Results from LM tests suggested that no addition of any parameters could significantly improve model fit. Furthermore, repeated contrasts were conducted to interpret the significant quadratic association between age and teacher autonomy support. Results revealed that teacher autonomy support sharply decreases up to 12 years old and slowly stabilizes after that point.

3.3 The mediating role of teacher and parental autonomy support

Based on the above findings, it was first hypothesized that age would be linearly and negatively related to the three types of autonomy support. Second, it was expected that

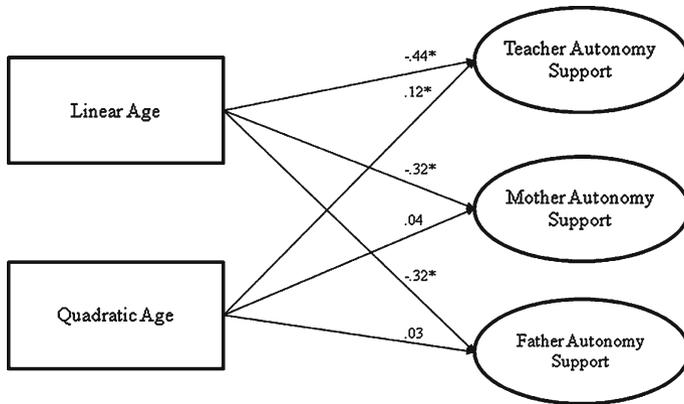


Fig. 2 Teacher, mother, and father autonomy support as a function of linear and quadratic age. *Note.* The measurement model is not presented for sake of clarity. * $p < .05$

age would be quadratically and positively related to teacher autonomy support. Third, in line with Self-Determination Theory (Deci and Ryan 2000), it was hypothesized that teacher, mother, and father autonomy support would positively predict both intrinsic and self-determined extrinsic motivation, but would negatively predict non self-determined extrinsic motivation and amotivation. Finally, it was expected that teacher and parental autonomy support would mediate the age-school motivation relationships.

As above, age was centered and then squared to represent the hypothesized quadratic trend in the model. The third model tested in the present study was composed of 2 observed (i.e., linear and quadratic age) and 7 latent variables with 8 indicators each for autonomy support variables (teacher, mother, and father autonomy support) and 3 indicators for school motivation variables (intrinsic, self-determined extrinsic, non self-determined extrinsic motivation, and amotivation). Twenty-one paths were specified: five between linear age and teacher, mother, and father autonomy support, and intrinsic and non self-determined extrinsic motivation; four between quadratic age and teacher autonomy support, and intrinsic, self-determined extrinsic, and non self-determined extrinsic motivation; and, all possible paths (i.e., twelve) among the three types of autonomy support and the four types of motivation. Furthermore, covariance paths between linear and quadratic age, among the three types of autonomy support, and among the four types of motivation were estimated. The model had an acceptable fit to the data. However, results revealed that several paths were not significant. Thus, a second model excluding these non significant paths was estimated. The model had an acceptable fit to the data, $\chi^2(df = 645, N = 1606) = 3468.85, p < .05, CFI = .91, NNFI = .90, RMSEA = .05$.

The model appears in Fig. 3. Age was found to be linearly and negatively related to teacher ($\beta = -.44$), mother ($\beta = -.33$), and father ($\beta = -.33$) autonomy support, and non self-determined extrinsic motivation ($\beta = -.22$). In addition, age was found to be quadratically and positively related to teacher autonomy support ($\beta = .11$) and intrinsic motivation ($\beta = .17$), and non self-determined extrinsic motivation ($\beta = .06$). Moreover, teacher autonomy support was found to be positively related to

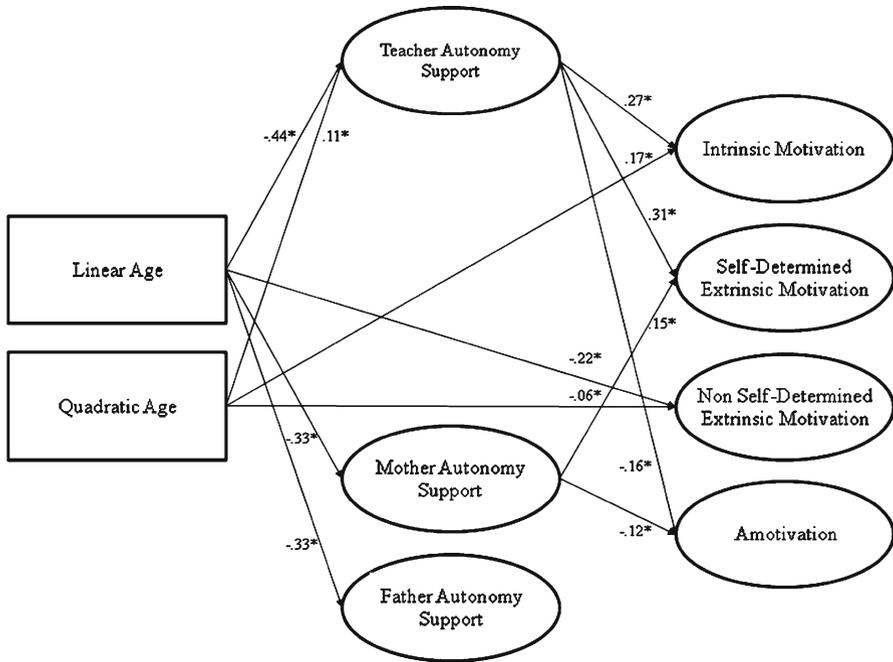


Fig. 3 The mediating role of autonomy support in the age-school motivation relationships *Note.* The measurement model is not presented for sake of clarity. * $p < .05$

intrinsic motivation ($\beta = .27$) and self-determined extrinsic motivation ($\beta = .31$), and negatively related to amotivation ($\beta = -.16$). Finally, mother autonomy support was found to be positively related to self-determined extrinsic motivation ($\beta = .15$) and negatively related to amotivation ($\beta = -.12$). Results from LM tests suggested that no addition or deletion of any parameters could significantly improve model fit.

In order to test whether the hypothesized model provided the best fit indices, an alternative model was tested where age predicted the four types of motivation (i.e., intrinsic motivation, self-determined extrinsic motivation, non self-determined extrinsic motivation, and amotivation) that, in turn, predicted the three types of autonomy support. The model had an acceptable fit to the data, $\chi^2(df = 638, N = 1606) = 3511.97, p < .05, CFI = .91, NNFI = .90, RMSEA = .05$. Nevertheless, this model resulted in increased chi-square and AIC values relative to the hypothesized model ($\Delta AIC = 57.12$). Thus, the hypothesized model was judged the most plausible model on the basis of both the data and theoretical grounds.

Indirect effects were investigated to further test the mediating role of teacher autonomy support between linear age and intrinsic motivation and between quadratic age and intrinsic and self-determined extrinsic motivation. Consequently, bootstrapped confidence interval estimates of the indirect effect (see Preacher and Hayes 2008) were calculated to confirm the significance of mediations. Bootstrapping is a statistical method that randomly constructs a number of re-samples of the original sample in order to estimate parameters. In the present study, the 95% confidence interval

of the indirect effects was obtained with 5,000 bootstrap resamples. Using bootstrap methods to estimate indirect effects is especially recommended in small-to-moderate samples (Shrout and Bolger 2002). It should be noted that the indirect effect is significant at $p < .05$ if the 95% confidence intervals do not include the value of zero. In the present study, the confidence interval was bias corrected given that this correction is believed to improve power and Type 1 error rates (MacKinnon et al. 2004). Results confirmed the mediating role of teacher autonomy support between linear age and intrinsic motivation ($\beta = -.12$; CI = $-.17$ to $-.11$), and between quadratic age and intrinsic ($\beta = .03$; CI = $.02$ to $.06$) and self-determined extrinsic motivation ($\beta = .04$; CI = $.02$ to $.05$).

4 Discussion

The main purpose of the present research was to investigate school motivation as a function of age in children aged 9–17 years from early elementary to the end of high school. Results with intrinsic motivation and self-determined extrinsic motivation revealed very similar patterns where there were a decrease until the age of 15 years and an increase after that point. Results with non self-determined extrinsic motivation showed a decrease up to 12 years and a stabilization after that point, while no trends were found for amotivation. A second purpose was to determine if teacher and parental autonomy support represents a mediator of such age effects, and examine the relative role of each type of autonomy support in the process. Age was found to be linearly and negatively related to teacher and parental autonomy support. In addition, age was found to be quadratically and positively related to only teacher autonomy support. Finally, although there were some direct effects of age on motivation, the results from the structural equation modeling analyses revealed that teacher autonomy support mediated the age-motivation relationships. Specifically, teacher autonomy support mediated the relationship between linear age and intrinsic motivation as well as those between quadratic age and intrinsic and self-determined extrinsic motivation. The role of mother autonomy support was much less prevalent than that of the teacher as it was only associated with self-determined extrinsic motivation and amotivation, in the same direction as teacher autonomy support. Once mother and teacher autonomy support were taken into consideration, the relationships between father autonomy support and school motivation were no longer significant. The present results generally provided support for the study hypotheses and lead to a number of conclusions.

4.1 Age effects on school motivation

Past research on age differences in intrinsic versus extrinsic motivation has either focused solely on intrinsic motivation (e.g., Gottfried et al. 2001; Harter 1981; Harter and Jackson 1992), on intrinsic motivation and one type of extrinsic motivation that would appear to reflect non self-determined extrinsic motivation in the self-determination framework (Corpus et al. 2009; Lepper et al. 2005), or on intrinsic motivation, different types of extrinsic motivation, and amotivation, but only at the high school level (Otis et al. 2005). The present study is the only one to examine students' intrinsic

and extrinsic motivation and amotivation as a function of age from early elementary to the end of high school. A first conclusion from the present findings is that motivation does vary as one goes through the elementary and high school curriculum. This conclusion is based on a number of important findings. A first one is that intrinsic motivation toward school does decrease from age 9 to 15 years. This finding replicates past research (e.g., Harter 1981; Harter and Jackson 1992; Gottfried et al. 2001; Lepper et al. 2005). It would thus appear that these effects are rather robust. Given the numerous studies that have shown that students' intrinsic motivation is linked to a host of positive educational outcomes including performance, school satisfaction, and persistence at school (see Niemiec and Ryan 2009; Reeve et al. 2007; Vallerand 1997), these findings are not good news. Clearly, we need to better understand why such negative effects take place in order to be in a position to prevent the occurrence of such effects.

A second finding of importance is that it appears that such negative age effects on intrinsic motivation are stopped and even reversed at age 16–17 years. These findings were first noted by Gottfried et al. (2001) with US students using a longitudinal design and were replicated in the present research with French-Canadian students from the Province of Quebec with a cross-sectional design. The fact that these findings were obtained in two different cultures using two different types of design suggests that this effect is rather robust. A third and similar finding is that while there was a decrease in self-determined extrinsic motivation as a function of age, there was also a reversal at age 16–17 years. The present study is the first to observe these effects. There might be a number of explanations for this reversal of effects in intrinsic motivation and self-determined extrinsic motivation in the last 2 years of the high school system. One possible explanation for this effect is that students at this level take fewer compulsory courses and have the opportunity to select several courses in line with their interests and future college orientation. Thus, some students may follow a more social studies track while others follow a pure and applied science track. Such an increase in autonomy toward subjects and courses to follow may translate into higher levels of intrinsic motivation and self-determined extrinsic motivation (see Deci and Ryan 2000, on this issue). Future research is needed in order to test this hypothesis. One thing seems clear, however: as Eccles (1993) suggested nearly 20 years ago, the systematic decrease in intrinsic motivation and self-determined extrinsic motivation can be reversed by some social factors (e.g., parental provision of positive experiences and involvement) and need not be accepted as unchangeable.

A fourth and final finding on the age effects on school motivation is that non self-determined extrinsic motivation decreased from 9 to 12 years old, while amotivation remained low throughout elementary and high school. These findings are in accordance with those obtained by Otis et al. (2005) who found a decrease in students' non self-determined extrinsic motivation and low levels of amotivation with students aged between 13 and 15 years. It should be underscored that these two forms of motivation (and especially amotivation) are the most important predictors of negative educational outcomes (see Deci et al. 1991; Reeve et al. 2004; Vallerand 1997). Thus, the findings to the effect that these two forms of motivation are less prevalent as one progresses through the school system are comforting. While non self-determined extrinsic motivation decreases up to 12 years old and stabilizes after that point, it should be noted that it nevertheless remains systematically higher than intrinsic motivation throughout

the elementary and high school years. A possible explanation for this finding might be that parents and teachers often emphasize to students that schoolwork is important for their future but often without conveying that it can also be enjoyable. Future research is needed in order to determine if this relative importance of non self-determined extrinsic motivation over intrinsic motivation has some bearing on negative educational outcomes. Furthermore, we need to ascertain whether the increasing higher levels of self-determined extrinsic motivation relative to non self-determined extrinsic motivation that most students experience throughout schooling serve a protective function. While [Ratelle et al. \(2007\)](#) have provided support for the protective function of self-determined extrinsic motivation over non self-determined extrinsic motivation and amotivation at the high school level using cluster analysis, these authors did not assess the prevalence of such a protective function across the entire schooling system. Research on this issue is badly needed.

4.2 Autonomy support as a mediator of the age-motivation relationships

Although past research had investigated age differences in students' intrinsic and extrinsic motivation, little research has attempted to empirically determine why such motivational variations from age 9 to 17 years occurred. The present study was the first to do so by assessing the role of teacher and parental autonomy support as a mediator of the age effects on school motivation. Thus, a second conclusion is that autonomy support from teachers accounts for a substantial part of the differences in intrinsic and self-determined extrinsic motivation between the elementary and high school systems. Indeed, results from the structural equation modeling analyses demonstrated that teacher autonomy support mediated the age-motivation relationships. These findings provide support for Self-Determination Theory ([Deci and Ryan 2000](#)) on the importance of key social agents' provision of autonomy support in order to facilitate intrinsic motivation and self-determined extrinsic motivation. What the present findings add to this literature, however, is that such a provision of autonomy support seems to decrease as a function of age. Thus, as students get older, teachers, mothers, and fathers are perceived by children as providing less autonomy support. It is not clear why such a decrease in perceived autonomy support takes place. It is possible that both parents and teachers do provide less autonomy support as children get older, possibly because they feel that as they get older, students should be able to self-regulate their own school motivation without having to rely on adults to do so. Another possibility is that there might be a lack of fit between students' expectations of (or desire for) increased autonomy support from the school environment as they get older and the lack of autonomy that they actually receive (see [Eccles 1993](#) on the stage-environment hypothesis). In line with the above, it is possible that parents and teachers do not change their behavior as children get older. Rather, it is students' expectations of autonomy support that increase, and thus, their perceptions of autonomy support from parents and teachers decrease. The negative comparison that they experience between the two may be sufficient to undermine intrinsic and self-determined extrinsic motivation and promote non self-determined extrinsic motivation and amotivation. Future research is clearly needed to test these rival hypotheses.

A third conclusion is that teacher autonomy support appears to be the most important mediator of the age-school motivation relationship, being related to three out of four types of motivation in the hypothesized direction. While mother autonomy support was found to facilitate self-determined extrinsic motivation and protect against amotivation, such effects were much weaker than those of the teacher. These findings are in line with past findings on the relative role of teacher and parental autonomy support in motivational processes (see [Eccles 1993](#); [Guay and Vallerand 1997](#); [Grolnick and Ryan 1989](#); [Vallerand et al. 1997](#)) and underscore the fundamental role that teachers play in children's school motivation.

Of major interest is that while father autonomy support was related to age and school motivation in a manner consistent with teacher and mother autonomy support, once these two variables were taken into consideration, the role of the father was no longer significant. Similar findings have been obtained in past research (see [Grolnick and Ryan 1989](#)). For instance, Grolnick and Ryan found that father autonomy support was unrelated to school motivation while mother autonomy support was. However, we wish to underscore that this does not mean that father autonomy support is not important in relation to educational outcomes. Thus, [Grolnick and Ryan \(1989\)](#) found that father autonomy support positively predicted other important educational variables such as students' sense of school competence, standardized achievement, and grades. Future research is needed to better understand the role of father autonomy support in children's schooling outcomes across the elementary and high school years.

A final conclusion on the age-school motivation relationship is that other mediators may be at play. Indeed, in spite of the significant mediating role of teacher autonomy support, age was found to directly and positively predict intrinsic motivation, but to directly and negatively predict non self-determined extrinsic motivation. Past research has shown that parents, and especially mothers ([Grolnick and Ryan 1989](#)), as well as teachers ([Taylor and Ntoumanis 2007](#)) who show high involvement and who provide structure with respect to children's education, have a positive effect on children's motivational processes. Thus, being involved with children's schooling and providing structure (see [Connell and Wellborn 1991](#)) may represent likely mediators of the age-school motivation relationship. Another potential mediator is psychological maturity. Indeed, an increasing amount of research has shown that with age, one's motivation to engage in important but non interesting activities such as tidying one's room and obeying authorities, becomes more self-determined in nature (see [Chandler and Connell 1987](#); [Sheldon et al. 2005](#)). Furthermore, additional research by [Sheldon and Kasser \(2001\)](#) has shown that with age, one's psychological maturity increases. It is thus possible that psychological maturity mediates the age-school motivation relationship. Finally, research by [Corpus and colleagues \(2009\)](#) reveals that school-promoted goal context can also influence children's school motivation. Future research is needed to determine if involvement and structure, as well as psychological maturity and goal-school context, represent additional mediators of the age-school motivation relationship.

4.3 Limitations

Some limitations of the present research need to be considered. First, the design used in the present study was cross-sectional in nature. Results from the present research

suggest that some of the motivational trends found in past studies (e.g., [Gottfried et al. 2001](#); [Lepper et al. 2005](#); [Otis et al. 2005](#)) are generalizable cross-nationally and that parental and teacher autonomy support may mediate variations in student school motivation as a function of age. However, it cannot be concluded that age or autonomy support played a causal role in changes in school motivation. Furthermore, cohort effects could also explain the effects. While this would be unlikely in light of past longitudinal studies in this area, future research using longitudinal and prospective designs is nevertheless needed to replicate and extend the present findings. Second, all scales were completed by the children themselves. Although research has shown that autonomy support scales completed by teachers (e.g., [Deci et al. 1981](#)) and objective interviews with parents ([Grolnick and Ryan 1989](#)) lead to results in line with the present ones, future research is needed to replicate the present findings while using more objective assessments such as observer reports. Third, several demographic variables not assessed in the present study (e.g., demographics of the schools, homogeneity or heterogeneity of the students within or across schools) might account for some of the effects of age in the prediction of motivational trends. In addition, we believe that other social factors (e.g., parental conditional regard, relational support from parents, teacher-provided structure) may account for the shifts in intrinsic and extrinsic motivation (see [Jang et al. 2010](#)). While a number of recent studies using the self-determination framework has underscored the role of autonomy support ([Sierens et al. 2009](#); [Reeve and Jang 2006](#)), future research should consider other potential mediators of the age-motivation relationship. Finally, the present findings were obtained with White French-Canadian children from one city (Quebec City). Additional research is needed in order to determine the generalization of such findings to other populations and cultures.

5 Conclusions

In sum, research over the past 35 years has underscored the importance of nurturing children's intrinsic motivation and self-determined extrinsic motivation while minimizing non self-determined extrinsic motivation and amotivation toward school. The present research has allowed us to chart the developmental trajectory of these motivational processes from early elementary to the end of high school. Of additional interest, the present research was also able to uncover a key mediator of such trajectories, namely autonomy support. Much research remains to be done, however, in order to identify the nexus of psychological mediators responsible for such effects and eventually put forward interventions that would ensure that all children maintain optimal forms of school motivation throughout their schooling, thereby allowing them to reap the educational benefits that they equally deserve ([Nicholls 1979](#)).

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