



Getting into the university track: Parents' implicit theories about ability predict which type of secondary school their children are tracked into

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Abstract

The few studies about whether parents' implicit theories about ability (ITs) predict their children's academic success and relevant parental behavior have produced mixed results. In response, research suggested that parents' ITs might be more important in contexts that make children's intellectual potential salient. Therefore, we investigated the role of parents' ITs in such a situation: After fourth grade in Bavaria, Germany, students are tracked into one of three secondary school types (one university-track and two non-university-track) depending on their grades (in mathematics, German, and basic science). First, we examined if parents' ITs predicted whether their children achieved the required grade average for a university-track school (that requires the highest grades). Second, because not all parents whose children achieved this threshold sent them to university-track schools, we investigated among the parents whose children had achieved the university-track threshold grade average whether parents' ITs predict their track choice. Participants were 578 fourth-graders and their parents. Parents' educational level was controlled for in all analyses. As expected, children of parents with a more incremental theory were more likely to achieve the university-track threshold grade average. For those children who achieved that threshold, parents with a more incremental theory were more likely to actually send their children to university-track schools. This effect was moderated by grade average. These results suggest that parents' ITs may indeed be more important in contexts that make children's intellectual potential salient, such as tracking decisions—especially if children's achievement raises even slight doubts about whether they will succeed.

Keywords Implicit theories about ability · Mindsets · Parents · Secondary school choice · Tracking

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1 Introduction

When individuals are confronted with challenges (see Blackwell et al., 2007) or must make learning-related decisions (Hong et al., 1999; Nussbaum & Dweck, 2008), it becomes increasingly important to which extent they think that abilities are malleable. Such beliefs about the malleability of abilities have been systematized in Carol Dweck's framework (Dweck, 2013; Dweck & Leggett, 1988). According to this framework, individuals' implicit theories about ability (ITs) can be placed along a continuum from entity theory (also called fixed mindset) to incremental theory (also called growth mindset). An entity theory is the belief that abilities have a large static part that cannot be significantly changed. An incremental theory is the belief that abilities can be improved by effort and practice. These two theories are most often treated as mutually exclusive alternatives and as two ends of a bipolar continuum, assuming that someone who strongly endorses an incremental theory does not endorse an entity theory, and vice versa (see Lüftenegger & Chen, 2017). ITs show relations to different aspects of academic behavior and academic outcomes. For example, incremental theorists (compared to entity theorists) tend to be more open to challenges (Davis et al., 2011), to choose more demanding courses (Yeager et al., 2019), and to achieve better grades (see Yeager & Dweck, 2020). These and other influences of ITs on learning and achievement behavior and on academic outcomes, documented in numerous studies in which ITs have been experimentally manipulated (e.g., Ehrlinger et al., 2015; Hong et al., 1999; Moorman & Pomerantz, 2010) or altered through interventions (Aronson et al., 2002; Blackwell et al., 2007; Yeager et al., 2019), underscore the pedagogical importance of these beliefs.

However, although the effects of learners' ITs on their academic success and relevant behaviors are well understood (see Burnette et al., 2013; Yeager & Dweck, 2020), the same is not true for the ITs of pedagogical agents—especially parents (see Muenks et al., 2015; Stern & Hertel, 2020). Though some studies have shown that parents with a more incremental theory tend to engage in behaviors that are conducive to children's academic success (Jose & Bellamy, 2012; Moorman & Pomerantz, 2010; Muenks et al., 2015), the findings in this area are mixed (see Haimovitz & Dweck, 2017). In addition, we are aware of very few studies that examined how parents' ITs are related to their children's academic achievement—and of no studies that examined how they are related to the educational decisions that parents make for their children (e.g., decisions related to tracking or school choice). Given the pivotal role of parents in their children's academic development (see Gonzalez-DeHass et al., 2005; Grolnick & Kurowski, 1999; Jacobs & Eccles, 2000; Pomerantz et al., 2005; Pomerantz et al., 2007), it is warranted to further investigate whether parents' ITs predict their academically relevant behavior and their children's academic success.

One category of situations which are critical to children's academic success consists of educational transitions, such as the transition from primary school to secondary school (see Dustmann, 2004; Schnepf, 2002). These transitions frequently require decisions about which educational institution to attend. In some cases, choice is constrained by a required threshold grade average. The choice of secondary school in particular, which is mainly made by parents due to students' young age at this time, has received considerable attention from researchers (see Stocké et al., 2011).

For example, in the United States, Australia, and the United Kingdom, this implies choosing between public and private schools with different focuses (see Triventi et al., 2016). In most of Germany, Austria, the Netherlands, Belgium, and Switzerland, this implies choosing between university-track and non-university-track (vocational-track) schools (see Benavot & Resnik 2006). These educational decisions derive importance from their impact on the extent of students' learning gains and their future educational and occupational opportunities (Dronkers & Robert, 2008; Schnepf, 2002). In Germany, for example, only university-track secondary schools offer students a direct route to university education, whereas the other types of secondary schools generally track students towards trades and less academically demanding forms of tertiary education (see Entorf & Davoli 2019). Research examining the parental factors that predict parents' choice of university-track secondary school (see Stocké et al., 2011) has focused primarily on the role of parents' socioeconomic background, and found that parents with higher socioeconomic status (usually measured in the form of educational level, occupational prestige and income) are more likely to send their children to university-track schools (Ditton et al., 2005; Ditton & Krüsken, 2006; Pietsch & Stubbe, 2007; Schneider, 2008; Schnepf, 2002). Research suggests that the more ambitious educational decisions of parents with higher socioeconomic status at the secondary school level are primarily due to their greater educational aspirations for their children (Neuenschwander & Malti, 2009).

Parents' ITs might also play an important role in educational transitions. However, there is a lack of research on this topic. Educational transitions such as the one from primary to secondary school seem well suited for examining the effect of parents' ITs—especially if children's admission to a particular type of school is contingent on achieving a threshold grade average. The rationale behind this assumption is researchers' suggestion that parents' ITs might be more likely to affect parents' behavior in situations in which parents reflect on their children's intellectual potential, such as when a tracking decision has to be made (see Haimovitz & Dweck, 2017). Moreover, it seems plausible that parents' ITs will be even more likely to affect parents' behavior when their children only barely achieve the threshold grade average required for admission to the desired type of school.

We therefore examined the predictive power of parents' ITs regarding children's academic achievement and parents' educational decisions in such a context: the transition into secondary education in the German federal state of Bavaria. Here, after fourth grade, the vast majority of children is either tracked into a university-track school (*Gymnasium*), whose completion qualifies students to attend university, or into one of two non-university-track (vocational-track) school types (*Realschule* and *Mittelschule*; for more details about the German secondary school system, see Entorf & Davoli, 2019 and Powell & Solga, 2011). As a prerequisite for getting tracked into university-track secondary education in Bavaria, children need to achieve a minimum grade average in the subjects of German, mathematics, and basic science (see Staatinstitut für Schulqualität und Bildungsforschung München, 2015). However, even if a child's grade average makes them eligible to attend a university-track secondary school, it is the parents who decide whether to send their children to such a school. As a result, on average, only about 75% of parents whose children are eligible for a university-track secondary school actually send them to such a school (see Staat-

sinstitut für Schulqualität und Bildungsforschung München, 2015)—despite the fact that the vast majority of schools in Germany are public and therefore free of charge (roughly 94% of German students attend public schools; see Basteck et al., 2015).

We pursue three objectives. The first is to examine to what extent parents' ITs predict whether their children achieve the university-track threshold grade average. The second is to examine whether parents' ITs predict if they send their children to a university-track school given that their children have achieved the threshold grade average. The third is to examine whether the relationship of parents' ITs with this decision is moderated by children's grade average in the sense that the effect of parents' ITs is heightened when children's grades are just good enough to meet the university-track threshold.

1.1 Research on correlates of parents' implicit theories

Overall, the correlates of parents' ITs remain under-researched (see Matthes & Stoeger, 2022). In terms of possible antecedents, one of the two relevant studies found that parents with higher levels of education were more likely to endorse an entity theory (Muenks et al., 2015), whereas the other one found education and ITs to be unrelated (Pomerantz & Dong, 2006). Regarding possible effects of parents' ITs, we are aware of only a small number of studies. The three studies that examined the relationship between parents' ITs and their children's academic achievement yielded inconsistent results (Matthes & Stoeger, 2018; Pomerantz & Dong, 2006; Rautiainen et al., 2016). We are also not aware of a single study which has examined the relationship between parents' ITs and parents' educational decisions, a parental behavior that can be very important for children's academic success (e.g., Schnepf, 2002).

Despite the current lack of studies on parents' ITs in the context of educational transitions, studies on the correlates of parents' ITs suggest that they might also play a role in educational transitions. For example, one study showed that the more parents held an incremental theory, the more they reported to encourage their children when they worked on difficult or frustrating tasks, and the more persistence their children showed when working on a challenging problem (Jose & Bellamy, 2012). Also, mothers who had received an incremental theory manipulation (compared to mothers who had received an entity theory manipulation) exhibited fewer negative emotions and less controlling interference while their children worked on challenging tasks (Moorman & Pomerantz, 2010). The mothers in the incremental theory group were also less likely to respond with heightened negative emotions and controlling interference when their children expressed frustration and helplessness (Moorman & Pomerantz, 2010). Finally, parents who held a more incremental theory reported that they responded in a more mastery-oriented manner when their children experienced difficulties with school-related activities (Muenks et al., 2015).

However, several studies did not find the expected relationships between parents' ITs and parents' behaviors toward their children that might positively influence educational transitions, nor between parents' ITs and their children's academic success. Two studies (Gunderson et al., 2013; Haimovitz & Dweck, 2016) found no relationship between parents' ITs and the extent to which parents praised children (Gunderson et al., 2013) and commented on children's setbacks (Haimovitz & Dweck, 2016)

in ways that are conducive to learning. Pomerantz and Dong (2006) found no direct relation between mothers' ITs and their children's academic (and emotional) functioning, but only found that mothers having a strong incremental theory protected children against the otherwise negative influence of the mothers' belief that their children lacked academic ability. Rautiainen et al. (2016) found a negative relationship between the strength of parents' incremental theory and their children's teacher-rated academic competencies.

When comparing the studies in which parents' ITs were related to parental behaviors that might be relevant to their children's academic success or educational transitions to the studies that did not find such relations, a pattern seems to emerge (see also Haimovitz & Dweck 2017): The investigations that found the expected relationships had been conducted mostly with reference to situations characterized by challenges or setbacks. For instance, Jose and Bellamy (2012) asked parents how they tried to teach their children to cope with difficult tasks. Muenks et al. (2015) asked parents how they would respond if their children had trouble with a task related to math or reading. Moorman and Pomerantz (2010) assessed mothers' behaviors while their children worked on a challenging puzzle task in their presence. Although no direct effect of parents' ITs was found in Pomerantz and Dong's (2006) study, mothers' endorsement of an entity theory was associated with poorer academic functioning of children in cases in which mothers also believed that their children's academic competencies were low. Observation of a similar pattern led Haimovitz and Dweck (2017) to suggest that parents' ITs might play a greater role in situations that make children's intellectual potential salient to their parents. However, this assumption has yet to be confirmed empirically.

One setting that is very likely to make children's intellectual potential salient is an educational transition—especially one that involves a high-stakes tracking decision. When parents have to make a consequential decision regarding their children's future educational careers, it seems likely that many of them will think about their children's intellectual potential, which should reinforce the effect of parents' ITs on their behavior (see Haimovitz & Dweck, 2017). This appears even more likely when a threshold grade average must be achieved in order to attend a more academically rigorous type of school. Such a threshold should provide parents with a salient benchmark against which to reflect on how likely their children are to succeed in that type of school. Given such a threshold, the extent to which parents' ITs predict their behavior should depend on how easily their children achieve the threshold. That is, in cases where children have excellent grades and easily achieve (i.e., far exceed) the threshold, parents' ITs are likely to be less relevant to parents' choice of school type. However, in cases where children only barely achieve the threshold, the more parents subscribe to an entity theory, the more hesitant they should be to send their children to a more challenging type of school. The reason for this is that entity theorists (compared to incremental theorists) should perceive such a situation, in which their children might experience difficulties or even failure, as more threatening. This can be assumed because entity theorists have been shown to feel more threatened by challenges (Liu et al., 2014), to judge the need for effort more negatively (Tempelaar et al., 2015), and to place more importance on achievement outcomes (Robins & Pals, 2002)—and because parents with an entity theory are expected to be more concerned with dem-

onstrating their children's competence and to feel more threatened by their children's poor academic performance (see Grolnick, 2003). Thus, in summary, educational transitions (especially ones that involve high-stakes decisions) are a context in which parents' ITs can be expected to predict parents' behavior—and in which the strength of this relationship can be expected to depend on children's academic achievement.

1.2 The present study

Our study is situated in the context of such an educational transition, namely the high-stakes tracking routine used in the German federal state of Bavaria. Here, students are required to achieve a minimum grade average for their parents to be permitted to send them to a university-track secondary school. We investigate three questions about the predictive power of parents' ITs in this context. The first question is whether parents' ITs predict if their children achieve the threshold grade average that would allow them to attend a university-track secondary school after fourth grade. We hypothesized that children whose parents hold a more incremental theory would be more likely to achieve this threshold grade average. This could be expected because parents with a more incremental theory tend to exhibit behaviors that are conducive to children's academic achievement, such as being more patient and learning-oriented and less controlling (Jose & Bellamy, 2012; Moorman & Pomerantz, 2010; Muenks et al., 2015). Consistent with this line of reasoning, we have already shown for a larger sample (of which the students and parents examined in this study constitute a subsample) that the children of parents with a more incremental theory tend to achieve better grades in those subjects that are relevant for the university-track threshold grade average (Matthes & Stoeger, 2018). Therefore, we aim to extend these results by showing that parents' ITs also predict whether their children's grade average for these subjects is above the university-track threshold.

The second question is whether, for those parents whose children have achieved the threshold grade average, parents' ITs predict whether they actually send their children to a university-track secondary school. We hypothesized that parents with a more incremental theory would be more likely to send their children to a university-track school (because they should be more likely to believe that their children will be able to meet this academic challenge). This could be expected because individuals with more incremental beliefs tend to perceive challenges as something that can be overcome through effort (Jones et al., 2012; Lin-Siegler et al., 2016) and consequently tend to have more confidence in the ability of others to do so (Rattan et al., 2012).

The third question is whether, among those parents whose children have achieved the threshold grade average, the effect of ITs on whether parents choose a university-track school is moderated by the grade average of their child. We hypothesized that the effect of parents' ITs would be stronger the closer the children were to just barely achieving the university-track threshold grade average, that is, the more parents had reasons to doubt their children's capacity to succeed. This hypothesis is based on the finding that entity theorists are more likely than incremental theorists to conclude that an individual's ability is low when that individual achieves unfavorable performance outcomes (Rattan et al., 2012).

In addition to parents' ITs, we expected that parents' educational level would also play a role. More specifically, we expected that the children of parents with higher levels of education would be more likely to achieve the university-track threshold grade average, and that such children would also be more likely to be sent to a university-track secondary school by their parents (provided that the children have achieved the threshold). This could be expected based on research showing that the higher parents' level of education is, the better their children's grades tend to be (see Sirin, 2005) and the more likely the parents are to send their children to a university-track school (Ditton & Krüsken, 2006; Schnabel et al., 2002; Schneider, 2008). To demonstrate that the effect of ITs is present regardless of parents' level of education, it was used as a control variable in all models.

2 Method

2.1 Participants

The sample consisted of 578 fourth-graders from 38 classrooms in 27 primary schools in Bavaria, Germany, and their parents. Participation was voluntary and anonymity was ensured. Data collection was part of a larger survey that involved students, parents, and teachers (see Matthes & Stoeger, 2018). The average age of the children was 9.8 years (ranging from 9 to 11 years, $SD=0.48$). Of the children, 54% were girls and 46% were boys. In 19% of cases, either the child themselves or at least one of their parents was not born in Germany.

The parent questionnaire was addressed to the parent or guardian who interacted the most with the child. Of these questionnaires, around 75% were returned. The parent questionnaire was mainly filled out by the mother (87% of the children, 503 cases). The remaining parent questionnaires were filled out either by the father (9%, 50 cases) or by the mother and father together (4%, 25 cases). For 26% of the children in the sample, either the mother or the father held a university degree. In 10% of cases, the father held a university degree, but the mother did not. In 6% of cases, the mother held a university degree, but the father did not. In 11% of cases, both parents held a university degree.

2.2 Measures

2.2.1 Parent's education

The highest educational attainment of both parents was included in the form of two dummy variables. The reference category for these was that neither parent had obtained a university entrance qualification (*Abitur*; the secondary school leaving certificate that qualifies the holder to study at a university in Germany; see Entorf & Davoli, 2019). The first dummy variable indicated whether at least one parent had obtained a university entrance qualification while at the same time neither of them had obtained a university degree. The second dummy variable indicated whether at least one parent had obtained a university degree.

2.2.2 Child's grade average

Children's academic achievement was operationalized in the form of the average of their grades in the subjects of mathematics, German, and basic science from the year-end report cards they received on May 1. These grades were provided by the respective teacher. In Bavaria (as in the rest of Germany), grades can range from 1 (best grade) to 6 (worst grade). In Bavaria, the grade average from these three subjects determines whether students are allowed to attend a university-track secondary school after fourth grade: In order to be tracked into such a school in the regular way,¹ children require a grade average of 2.3 or better (see Staatsinstitut für Schulqualität und Bildungsforschung München, 2015). To make the results easier to interpret, we inverted the grades for our analyses so that higher values reflect greater academic achievement. As a result of this, a value of 6 represents the best possible grade average and a value of 4.7 the university-track threshold grade average.

2.2.3 Parents' incremental theory

The degree to which parents held an incremental theory was assessed with an adaptation of the 6-item scale from Ziegler and Stoeger (2010). The original scale assessed learners' ITs with regard to their mathematical abilities by asking them to what extent they believe that ability deficits in the domain of mathematics can be overcome through effort and practice. We modified these items so that they captured parents' ITs regarding their children's general school-related ability. The parent questionnaire that contained this scale was answered by parents in early May. Parents were given the following instructions for answering the items: "Please rate the following statements in terms of your child's learning for school and in school." A sample item read: "What my child is capable of is not fixed. They can learn new things and expand their abilities." The items were answered on a six-point Likert scale that ranged from 1 (*completely disagree*) to 6 (*completely agree*). The scale's Cronbach's alpha was .66.

2.2.4 University-track threshold grade average achieved

The first outcome was whether children achieved the threshold grade average (i.e., a value of 4.7 on the grade average variable) that allows one to attend a university-track secondary school in Bavaria (dummy variable with 0 representing "no" and 1 representing "yes"). This variable was calculated from children's grade average that is based on the subjects of mathematics, German, and basic science. These grades originated from the year-end report cards and were provided by the teachers.

2.2.5 Parents chose university-track secondary school

The second outcome was whether parents chose to send their children to a university-track secondary school (dummy variable with 0 representing "no" and 1 representing "yes"). This variable was based on information about the type of school each student was going to be tracked into, provided by the teachers at the very end of the school

year. Parents made this decision between May (when their children received the year-end report cards) and the end of the school year in late July.

2.3 Plan of analysis

We employed logistic regression analysis because we predicted the dichotomous outcomes of (a) whether children achieved the university-track threshold grade average and (b) whether parents of those children who achieved this threshold actually sent their children to a university-track school. To test our hypotheses, we calculated two series of models. The first series was based on the total sample of students ($N=578$). The second series was based on the subsample of those students who qualified to attend a university-track school due to a value of 4.7 or higher on the grade average variable (53% of the total sample, $N=305$). The two variables parents' incremental theory and child's academic achievement were z -standardized before calculating the models. This was done for ease of interpretation and because continuous variables need to be centered before calculating an interaction term for them (see Cohen et al., 2003).

For the models based on the total sample, the first variable we included was parents' education, followed by parents' incremental theory. This made it possible to test our first hypothesis, that the strength of parents' incremental theory should be positively related to whether their children achieved the university-track threshold grade average—above and beyond the well-known influences of parents' education on children's academic achievement.

For the models based on the sample of qualified students, the first variables we included were parents' education and child's grade average, followed by parents' incremental theory and the interaction effect between parents' incremental theory and child's grade average. Thus, we first included known predictors for secondary school choice in order to find out in the next step whether parents' incremental theory provides predictive power above and beyond them. Second, we included parents' incremental theory to test our second hypothesis that parents with a stronger incremental theory should be more likely to send their children to a university-track school. Third, we included the interaction effect between parents' incremental theory and child's grade average (i.e., the product of these two variables). This was done to test our third hypothesis that, the closer children's grade average was to not meeting the university-track threshold, the better parents' incremental theory should predict whether they send their children to such a school.

To examine this interaction effect in more detail by comparing the effect of parents' incremental theory for different levels of children's academic achievement, we used version 3.5 of the PROCESS macro for SPSS (Hayes, 2020). In the subsample of students who qualified for university-track school attendance because of achieving the threshold grade average, we tested the effect of parents' incremental theory at different levels of children's grade average (i.e., for the mean and for one standard deviation above and below it).

As recommended (Greenland et al., 2016), we used one-sided significance tests for all coefficients for which we had a clear, theory-based expectation regarding the

direction of the respective effect. This applies to all significance tests except to those for the constants in the logistic regression models.

3 Results

3.1 Preliminary analyses

First, we calculated descriptive statistics for all variables in our models. All these analyses were conducted both for the total sample and for the subsample of students who qualified for university-track school attendance by achieving the threshold grade average. Both samples showed somewhat similar values for both child's grade average (total sample: $M=4.40$, $SD=0.81$; subsample of qualified students: $M=5.03$, $SD=0.36$) and strength of parents' incremental theory (total sample: $M=4.68$, $SD=0.62$; subsample of qualified students: $M=4.89$, $SD=0.54$). There was a positive relationship between child's grade average and parents' incremental theory in both the total sample ($r=.43$, $p<.001$) and in the subsample of qualified students ($r=.15$, $p=.009$). This positive correlation was also evident in the group of the 273 students who were not qualified to attend a university-track school ($r=.30$, $p<.001$). The size of this correlation did not differ significantly between the group of students who were qualified to attend a university-track school and those who were not ($z=1.89$, $p=.059$).

The proportion of children who were sent to a university-track secondary school was 38% in the total sample and 70% in the subsample of qualified students. In terms of parents' education, in the total sample, 10% of children had at least one parent with a university entrance qualification (but no parent with a university degree) and 26% had at least one parent with a university degree. In the subsample of qualified students, 10% had at least one parent with a university entrance qualification (but no parent with a university degree) and 41% had at least one parent with a university degree.

3.2 Logistic regression analyses

The two models based on the total sample that predict whether children achieved the university-track threshold grade average (Model 1a and Model 1b) can be found in Table 1. In Model 1a, the two indicators of parents' education (dummy variables for "only university entrance qualification" and for "university") were used as the only predictors. Here, as expected, children with at least one parent with a university entrance qualification (but without a parent with a university degree) were more likely to achieve the university-track threshold grade average than children without a parent with a university entrance qualification ($OR=1.60$, $p=.047$). The same was true for children with at least one parent with a university degree compared to children without a parent with a university entrance qualification ($OR=8.18$, $p<.001$). In Model 1b (after adding parents' incremental theory as a predictor), children with parents that held a stronger incremental theory were more likely to achieve the uni-

Table 1 Logistic Regression Models for the Total Sample Predicting Whether Children Achieved the University-Track Threshold Grade Average

Predictor	<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	95% CI for <i>OR</i>
Model 1a					
Parents' education: Only university entrance qualification ^a	0.47	0.28	.047	1.60	[0.92, 2.76]
Parents' education: University ^a	2.10	0.25	<.001	8.18	[5.01, 13.36]
Constant	–	0.11	<.001	0.67	
	0.41				
Model 1b					
Parents' education: Only university entrance qualification ^a	0.19	0.30	.262	1.21	[0.67, 2.19]
Parents' education: University ^a	2.06	0.27	<.001	7.82	[4.66, 13.13]
Parents' incremental theory	0.86	0.11	<.001	2.37	[1.90, 2.96]
Constant	–	0.11	.002	0.70	
	0.35				

Note. Cox & Snell $R^2 = .25$ and Nagelkerke $R^2 = .33$ for final model. All *p* values except for those of the constants are based on one-sided testing. All non-dummy variables were *z*-standardized before the analyses.

^a Dummy variables representing the highest educational attainment of both parents (reference category: no university entrance qualification).

versity-track threshold grade average ($OR=2.37$, $p<.001$). This confirmed our first hypothesis.

The four models based on the subsample of students qualified to attend a university-track secondary school that predict whether parents actually sent their children to such a school (Model 2a, Model 2b, Model 2c, and Model 2d) can be found in Table 2. When only the two indicators of parents' education were used in Model 2a, as expected, children with at least one parent holding a university entrance qualification (but without a parent holding a university degree) were much more likely to be sent to a university-track school ($OR=5.90$, $p=.001$) than children without a parent holding a university entrance qualification. The same was true for children with at least one parent holding a university degree ($OR=5.24$, $p<.001$). These effects remained significant after also including children's grade average in Model 2b. Here, the better the children's grade average was, the more likely their parents were to send them to a university-track school ($OR=2.34$, $p<.001$). In Model 2c (after adding parents' incremental theory as predictor), the more parents held an incremental theory, the more likely they were to send their children to a university-track school ($OR=1.49$, $p=.003$). This confirmed our second hypothesis. In Model 2d, after adding the interaction between strength of parents' incremental theory and children's grade average, we found that this interaction was significant and in the expected direction ($OR=0.73$, $p=.033$; see Fig. 1).

Next, as recommended to illustrate interaction effects (see Cohen et al., 2003), we calculated the effects of the strength of parents' incremental theory on parents'

Table 2 Logistic Regression Models for the Subsample of Qualified Students Predicting Whether Parents Sent Their Child to a University-Track Secondary School

Predictor	<i>B</i>	<i>SE</i>	<i>p</i>	<i>OR</i>	95% CI for <i>OR</i>
Model 2a					
Parents' education: Only university entrance qualification ^a	1.77	0.56	.001	5.90	[1.97, 17.69]
Parents' education: University ^a	1.66	0.30	<.001	5.24	[2.89, 9.50]
Constant	0.14	0.17	.411	1.15	
Model 2b					
Parents' education: Only university entrance qualification ^a	1.97	0.58	<.001	7.18	[2.30, 22.37]
Parents' education: University ^a	1.63	0.32	<.001	5.10	[2.74, 9.48]
Child's grade average	0.85	0.18	<.001	2.34	[1.63, 3.35]
Constant	0.28	0.18	.123	1.32	
Model 2c					
Parents' education: Only university entrance qualification ^a	1.98	0.59	<.001	7.22	[2.27, 22.95]
Parents' education: University ^a	1.71	0.32	<.001	5.50	[2.91, 10.39]
Child's grade average	0.80	0.19	<.001	2.23	[1.55, 3.21]
Parents' incremental theory	0.40	0.14	.003	1.49	[1.12, 1.97]
Constant	0.28	0.18	.125	1.32	
Model 2d					
Parents' education: Only university entrance qualification ^a	2.04	0.60	<.001	7.70	[2.37, 25.04]
Parents' education: University ^a	1.76	0.33	<.001	5.78	[3.02, 11.08]
Child's grade average	0.79	0.19	<.001	2.20	[1.53, 3.16]
Parents' incremental theory	0.32	0.15	.020	1.37	[1.02, 1.85]
Parents' incremental theory × child's grade average	–	0.17	.033	0.73	[0.52, 1.02]
Constant	0.29	0.18	.115	1.33	

Note. Cox & Snell $R^2 = .23$ and Nagelkerke $R^2 = .32$ for final model. All *p* values except for those of the constants are based on one-sided testing. All non-dummy variables were *z*-standardized before the analyses.

^a Dummy variables representing the highest educational attainment of both parents (reference category: no university entrance qualification).

decisions for grade averages of (a) one standard deviation above the mean, (b) equal to the mean, and (c) one standard deviation below the mean. Thus, we compared (a) children with above-average grades relative to the subsample mean (i.e., with a grade average value of around 5.3, which is one standard deviation above the subsample mean), (b) children with grades equal to the subsample mean (i.e., with a grade average value of around 5.0), and (c) children with the worst possible grade average that is still above the university-track threshold (i.e., with a grade average value of around 4.7, which is one standard deviation below the subsample mean). For children with above-average grades, strength of parents' incremental theory was unrelated to whether they sent their children to a university-track school ($OR = 1.00$, $p = .498$). Yet strength of parents' incremental theory was positively related to whether they sent

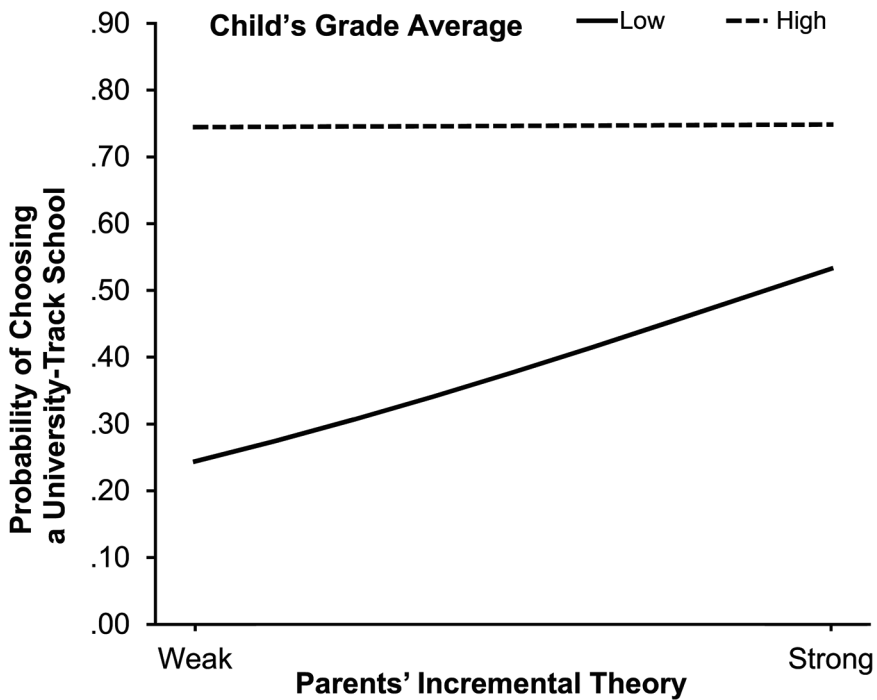


Fig. 1 Interaction Effect Between Strength of Parents' Incremental Theory and Children's Grade Average

Note. Values are based on Model 2d from Table 2 that controls for parents' education. Low/weak=one standard deviation below the mean, high/strong=one standard deviation above the mean.

their children to a university-track school for children whose grades were closer to the university-track threshold. This was the case for both children with grades equal to the subsample mean ($OR=1.37, p=.020$) and for children with the worst possible grade average that is still above the university-track threshold ($OR=1.87, p<.001$). Thus, the predictive power of parents' incremental theory was stronger the closer the children's grade average was to not meeting the university-track threshold, which confirmed our third hypothesis.

4 Discussion

The goal of this study was to investigate the relationship between how strongly parents endorse an incremental theory about academic ability and whether their children are tracked into university-track secondary education after fourth grade—the most demanding and desirable of the three main secondary school types in the German school system, whose completion qualifies students to attend university and provides the best educational and occupational opportunities (see Pietsch & Stubbe, 2007; Schnepf, 2002). In this context, we addressed three questions. First, are the children of parents with a stronger incremental theory more likely to achieve the univer-

sity-track threshold grade average? Second, are parents with a stronger incremental theory more likely to send their children to a university-track school, provided that the children have achieved the threshold grade average? Third, does the relationship between the strength of parents' incremental theory and their choice of a university-track secondary school become stronger the closer the child's grade average is to the threshold for admission to that type of school? To obtain more robust results, we controlled for parents' level of education in all analyses. The study was conducted in an effort to contribute to the limited literature on the relationship between parents' ITs and their children's academic success, and especially to examine more closely the conditions under which such relationships can be found.

Our first hypothesis was confirmed. The more parents endorsed an incremental theory, the more likely their children were to achieve the threshold grade average required to attend a university-track secondary school after fourth grade. This was to be expected, as our sample was based on that of a study in which parents' incremental theory predicted better grades (in the three subjects from which the threshold grade average is derived) for their children (Matthes & Stoeger, 2018). Extending the findings of this previous investigation, the current study shows that this positive relationship between the strength of parents' incremental theory and children's academic achievement makes children of incremental theorists more likely to achieve the university-track threshold grade average. The finding is also in line with researchers' suggestion that parents' ITs exert their influence primarily in situations that make children's intellectual potential salient (Haimovitz & Dweck, 2017), such as in the context of tracking decisions, as examined our study.

The results also confirmed our second hypothesis about the parents of those 53% of children who had achieved the university-track threshold grade average. The more those parents endorsed an incremental theory, the more likely they were to be among the 70% of eligible parents who sent their children to a university-track school rather than a non-university-track school. This finding is in line with studies that show incremental theorists to be more likely to embrace challenges than entity theorists (Davis et al., 2011; Jones et al., 2012; Nussbaum & Dweck, 2008) and to have more confidence that other individuals can overcome challenges (Rattan et al., 2012). Our study extends this to the area of parents' educational decisions by demonstrating that parents who endorse more of an incremental theory seem to be more likely to believe that their children will be able to cope with the increasing academic challenges of Germany's most demanding secondary school track. To the best of our knowledge, this is the first study to investigate the relationship between parents' ITs and their educational decisions. Thus, our finding is also consistent with the suggestion of Haimovitz and Dweck (2017) that parents' ITs should better predict parents' learning-related behavior in situations that highlight their children's intellectual potential—a suggestion that might help clarify the mixed findings in this area. It should be noted, however, that there are some study results that are inconsistent with this assumption. For example, Muenks and colleagues (Study 2 in Muenks et al., 2015) found a relationship between parents' ITs and parental behaviors despite an absence of specific challenges or setbacks. Furthermore, Haimovitz and Dweck (2016) found no such relationship despite querying parents' reactions to an imagined bad grade for their children. However, it seems conceivable that parents' reactions to

an actual academic setback of their children depend more on parents' ITs than their reactions to an imagined setback. Still, given the paucity of existing studies on the relationship between parents' ITs and parents' behaviors, the observation of such patterns can merely be understood as hypotheses that need to be systematically tested in further studies.

Finally, the results confirmed our third hypothesis—that in the group of those children who qualified to attend a university-track secondary school, children's grade average should be related to how much parents' ITs predict whether they choose a university-track school. For those children who scored considerably above the university-track threshold grade average, it was irrelevant for parents' choice of school type how much parents endorsed an incremental theory. However, the closer their children were to not achieving the university-track threshold grade average, the more influential parents' ITs became. Among those children who barely achieved the university-track threshold grade average, the degree to which parents endorsed an incremental theory was a substantial predictor of whether they chose a university-track school for their children. These results are consistent both with evidence that the effect of ITs is enhanced in situations that threaten a person's perceived ability (see Burnette et al., 2013) and with evidence that such situations are sometimes necessary for ITs to take effect (Davis et al., 2011; Dunning, 1995; Snyder et al., 2014). As far as we know, our study is the first to show that the strength of this salience effect varies depending on the extent to which parents have reasons to doubt their children's capacity to succeed academically.

Although this was not the focus of our study, the results also contribute to the literature on the predictors of parents' decision to send their children to a university-track secondary school in Germany. Our results show that parents with a stronger incremental theory are more likely to send their children to a university-track school, provided that the children are qualified to attend such a school—even when controlling for parents' education and children's academic achievement. Our study thus provides evidence that parental beliefs (in our case, about the nature of abilities) can predict school type choice, whereas previous studies that considered parental characteristics focused mainly on aspects such as parents' education (Ditton et al., 2005; Schneider, 2008; Schnepf, 2002), occupational prestige (Ditton et al., 2005; Ditton & Krüsken, 2006; Pietsch & Stubbe, 2007), ownership of cultural goods such as books (Schnepf, 2002; Wagner et al., 2010), and income (Pietsch & Stubbe, 2007). Consistent with these studies, we found that higher parental education was a strong positive predictor of the decision to send children to a university-track school. From a theoretical perspective, these effects are usually explained in terms of families with higher socioeconomic status being more interested in maintaining this status in the next generation through education and having more confidence in achieving challenging educational goals (see Stocké et al., 2011).

4.1 Limitations and future research

Although our study provides new insights into how parents' ITs are related to their children's academic success and under what circumstances such relationships can be observed, the study also has a number of limitations. One limitation is that the study

design cannot rule out third-variable influences that might partially account for the relationships between parents' ITs and their children's achievement of the university-track threshold grade average and parents' choice of school type. To partially mitigate this problem, we included parents' level of education in all our models—a background variable known to predict both students' academic achievement (see Sirin, 2005) and parents' educational decisions (Bosetti & Pyryt, 2007; Goldring & Phillips, 2008; Maaz et al., 2008; Schnabel et al., 2002; Schneider, 2008; Triventi, 2013). In addition, children's grade average acted as a control variable in all models to account for the influence of children's actual academic ability. However, despite the predictive power of parents' education, this is only one of several relevant facets of parents' socioeconomic status. The other facets, namely parents' income and occupational prestige, are also known to predict children's academic achievement (see Sirin, 2005) and parents' educational decisions (Bosetti & Pyryt, 2007; Ditton et al., 2005; Goldring & Phillips, 2008; Schnabel et al., 2002). Therefore, further studies could investigate whether the relationships we have demonstrated still hold when controlling for these variables.

Another related limitation is that there might also be third-variable influences at the school level that we did not account for—in particular, influences on children's academic achievement that might also affect parents' ITs. However, although there are several well-documented predictors of students' academic achievement at the school level (e.g., effectiveness of the school administration, class size, and instructional methods used; see Hattie, 2008, for an overview), most of them seem unlikely to be strongly related to parents' ITs. Still, one school-level factor that might play a role and that should be included in further studies is the overall socioeconomic status of the student population, which has been shown to predict individual students' academic achievement (Perry & Mcconney, 2010) and that might also predict parents' choice of school type. However, there was little systematic variation at the school level in children's grade average ($ICC=0.08$) and in whether children achieved the university-track threshold grade average ($ICC=0.06$), which indicates that the relevant differences between schools in our sample were rather modest.

Another limitation is that our study did not include two belief variables that might play a role in parents' educational decisions, namely parents' perceptions of children's current level of academic ability and parents' educational aspirations. Parents' perceptions of their children's academic ability are an important aspect of parents' learning-related behaviors (see Pomerantz et al., 2007), predict children's academic success (see Pomerantz et al., 2005), and might therefore also affect parents' educational decisions. Similarly, parents' educational aspirations are a strong positive predictor of children's academic achievement (Fan & Chen, 2001) and have also been shown to predict educational decisions at the secondary school level (Neuenschwander & Malti, 2009). However, based on previous research, we are not sure to what extent these two belief variables, in combination with ITs, might contribute to explaining parents' decisions. Although one might expect some overlap between parents' assessment of their children's academic ability and parents' ITs, these two variables seem to be largely unrelated (Muenks et al., 2015). Furthermore, although we are not aware of any studies that have examined the relationship between parents' educational aspirations and parents' ITs, a study with students has demonstrated

only a small positive correlation between endorsing a more incremental theory and having higher educational aspirations (Ahmavaara & Houston, 2007). Therefore, it seems likely that controlling for parents' beliefs about children's level of academic ability and parents' educational aspirations will have little impact on the relationship between parents' ITs and their educational decisions. Nevertheless, it would be advisable to consider these two belief variables and their possible interactions with parents' ITs in future studies.

A more general limitation is that our study does not allow conclusions to be drawn about the causal relationship between parents' ITs and children's academic success. This is because the study was essentially cross-sectional, with parents' ITs and children's grades assessed in the same timeframe. To draw causal conclusions, further studies that deliberately alter parents' ITs would be helpful. This could be done by conducting intervention studies where parents are taught an incremental theory and it is examined how this affects their learning-related behaviors and children's academic success. In addition, whether such an intervention affects parents' choice of school type could be investigated in a follow-up study.

Another limitation lies in the scale that was used in our study to assess parents' ITs. First, the scale's reliability (Cronbach's $\alpha = .66$) is at the lower end of what is considered acceptable (see Nunnally, 1967). However, a low reliability alone should only reduce the predictive power of parents' ITs. Therefore, it seems likely that our results underestimate their actual predictive power. Second, our scale takes a somewhat different approach to measuring ITs than the scales used in most other studies. The items of our scale ask about the extent to which respondents believe that their children's abilities are malleable or static, whereas the widely used three items proposed by Carol Dweck (see Hong et al., 1999) ask about the extent to which respondents think that abilities in general are malleable or static. However, because ITs are understood as key beliefs around which a whole system of allied beliefs and goals is organized (see Molden & Dweck, 2006), it seems very likely that individuals have the same kind of IT about abilities in general that they have about their own abilities and the abilities of others. Also, there are other studies about parents' ITs that have asked about parents' beliefs about the nature of their children's abilities rather than about the nature of abilities in general (Jose & Bellamy, 2012; Rautiainen et al., 2016). Still, we would recommend that replication studies use both the scale we employed and well-established scales (see Blackwell et al., 2007; Hong et al., 1999) to assess parents' ITs.

A limitation related to our study's outcomes is that we only examined whether parents' ITs predict if students transfer to a university-track secondary school, but not how successfully they navigate this transition. This question merits investigation because the transition to secondary school is often accompanied by a decline in academic functioning (see Benner, 2011; Benner et al., 2017; Jindal-Snape et al., 2020) and because there is evidence that a more incremental theory may protect students from such a decline (Blackwell et al., 2007). Thus, parents' ITs might also play a role in this context. Because parents with a more incremental theory tend to behave toward their children in ways that facilitate academic success (Jose & Bellamy, 2012; Matthes & Stoeger, 2018; Moorman & Pomerantz, 2010; Muenks et al., 2015) and to be more involved in children's learning (Jiang et al., 2019; Muenks et al., 2015),

these children might find it easier to adapt to the increasing academic demands of secondary school. Consistent with this, supportive parenting has been identified as a protective factor against decline in academic functioning during the transition to secondary school (Serbin et al., 2013). Thus, future studies on parents' ITs in the context of educational transitions could therefore also examine their predictive power for children's academic functioning after the respective transition.

A final limitation is that our study examined parents' educational decisions in the context of one particular educational system and for a specific educational transition, thus limiting generalizations to other educational systems and other educational decisions. The transition to secondary education might be more important for parents in countries with school systems that employ between-schools tracking (as in Germany and other European countries such as Austria, Belgium, the Netherlands, and Switzerland; see Benavot & Resnik, 2006) than for parents in countries without this type of tracking (such as the United States or the United Kingdom). For example, in countries that employ course-by-course tracking instead of between-schools tracking and that allow parents to choose among several public and private schools with different focuses (such as the United States; see Chmielewski, 2014; Triventi et al., 2016), secondary school choice might not be as critical as in countries with between-schools tracking. This could lead to parents' ITs having less predictive power for secondary school choice than was the case in our study. Still, in these countries, it might be worthwhile to examine the predictive power of parents' ITs for educational decisions such as course and track choices in the context of in-school tracking or for decisions about public or private schools. In addition, it would be interesting to examine the role that ITs play for later educational decisions, such as whether to attend university, where parents' socioeconomic status and related variables still have a major impact (see Giani, 2015; Lörz, 2017).

4.2 Conclusion

The main contribution of our study consists in providing additional evidence for the relevance of parents' implicit theories about ability to their children's academic success and parents' educational decisions for their children. More importantly, our results shed light on the circumstances in which parents' ITs might have an impact. It seems that the influence of parents' ITs on their academically relevant behavior, in the case of our study on their secondary school choice, becomes stronger the more parents are given reasons to doubt their children's current academic ability. Additional studies could further substantiate this conclusion by examining the predictive power of parents' ITs for various educational decisions (e.g., what courses parents choose for their children, or whether their children enroll in a university).

An important broader theoretical implication of our study is that it illustrates how the strength of IT's relationship to academically relevant variables depends on the presence or threat of adversity, challenges, and setbacks. This could also explain why the effects of ITs in situations without adversity, challenges, or setbacks tend to be somewhat smaller (see Burnette et al., 2013). For example, although some researchers have argued that the predictive power of learners' ITs for their academic achievement is not particularly strong (Sisk et al., 2018; but see Yeager & Dweck 2020,

for a reply), interventions that target students' ITs have been shown to improve the academic achievement of low-performing students (Yeager et al., 2019). ITs seem to be particularly important for individuals who are increasingly confronted with challenges and adversities, such as girls and women in male-dominated fields such as mathematics (Degol et al., 2018; Good et al., 2012) and members of minority or marginalized groups who are confronted with negative stereotypes (Aronson et al., 2002; Binning et al., 2019; Good et al., 2003). Thus, whereas under ideal circumstances, entity theorists might not experience major negative effects of their mindsets, those who are regularly confronted with challenges or who need to make decisions about other people's potential in such contexts seem to be well advised to adopt an incremental theory about ability.

In terms of practical implications, our findings suggest that parents' ITs and related parental behaviors might be a fruitful target for interventions directed at parents, assuming that additional, stronger evidence can be provided that an incremental theory among parents can facilitate children's academic success. Although the mechanisms by which parents' ITs are related to children's academic success are still poorly understood, existing studies suggest that parents with a more incremental theory tend to behave in a more learning-oriented and patient manner towards their children, rather than exhibiting controlling behavior or negative affect (Jose & Bellamy, 2012; Matthes & Stoeger, 2018; Moorman & Pomerantz, 2010; Muenks et al., 2015). Because these behaviors have been shown to facilitate children's academic success (see Pomerantz et al., 2007), interventions that teach parents an incremental theory might also have a positive impact on children's academic success. Because such interventions already exist for learners and have been shown to strengthen their incremental beliefs (see Yeager et al., 2019), these interventions could be adapted to target parents. However, because an incremental theory by itself is often insufficient to elicit beneficial parental behaviors (see Haimovitz & Dweck, 2017), it would be helpful to supplement such interventions with units that teach those behaviors. One such behavior is framing failure as something beneficial (i.e., a learning opportunity) rather than something debilitating that needs to be avoided. Parents should also be taught to model solution-oriented responses to setbacks for their children and to treat difficulties as a normal and positive part of learning (see Haimovitz & Dweck, 2017). If parents are taught an incremental theory and behaviors that support children's learning, their children might be more successful academically and more likely to attend a university-track secondary school or participate in other challenging educational offerings. Moreover, these children should be better prepared for the setbacks they are likely to experience at some point during their academic careers.

Footnotes

In addition to the regular way of transferring to a university-track secondary school, students in Bavaria can also transfer with a grade average that is worse than 2.3 if they take part in probationary lessons beforehand. However, in the year the study was conducted, over 97% of those students who transferred to a university-track school after fourth grade did achieve the required grade average (see Staatsinstitut für Schulqualität und Bildungsforschung München, 2015).

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