**On the interplay of motivational characteristics and school grades: the role of Need for Cognition**

**or**

**Changes in Need for Cognition and Ability Self-Concept predict changes in School Grades**

(or

Everything is connected: Need for Cognition, Ability Self-Concept, School Grades and their interplay over time ;-))

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**Abstract**

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**Introduction**

Over the past decades, a large body of research has examined variables predicting performance in school. Comprehensive meta-analytic findings demonstrated intelligence to be the strongest predictor for academic achievement (e.g., Deary, Strand, Smith, & Fernandes, 2007; Kriegbaum, Becker, & Spinath, 2019), but motivational variables have consistently been found to have predictive value for school performance, too (e.g., Kriegbaum et al., 2019; Steinmayr, Weidinger, Schwinger, & Spinath, 2019). In this context, motivational concepts like ability self-concepts, hope for success and fear of failure, interest and values are well known and equally established indicators (e.g., Wigfield & Eccles, 2000; Wigfield & Cambria, 2010) that are subsumed under the umbrella term of achievement motivation (Steinmayr et al., 2019).

Over the last years, an additional predictor of academic performance came into the focus of researchers in this field of research: Need for Cognition (NFC), the stable intrinsic motivation of an individual to engage in and enjoy challenging intellectual activity (Cacioppo, Petty, Feinstein & Jarvis, 1996). According to the Investment Theory (Ackerman & Heggestad, 1997), traits such as NFC determine how individuals in general invest their cognitive resources and how they deal with cognitively challenging material. It has been shown that NFC is related to academic performance in different stages of academic life (e.g., Ginet & Py, 2010; Preckel, 2014; Luong et al., 2017; Grass, Strobel, & Strobel, 2017; for a meta-analytical review see von Stumm & Ackerman, 2013) as well as to behaviour associated with success in learning. As examples, NFC was found to be related to ability self-concept (e.g., Dickhäuser & Reinhard, 2010; Luong et al., 2017), to interest in school (e.g., Preckel, 2014) or to deeper processing while learning (Evans, Kirby & Fabringar, 2003; Luong et al., 2017).

The enjoyment of accomplishing something, the interest in task engagement and the intrinsic value of working on a task have been suggested to be relevant to learning and academic achievement and have been integrated into models of achievement motivation (e.g., Wigfield & Eccles, 2000, see also Wigfield & Cumbria, 2010 for a review). Surprisingly, the concept of a more general joy of thinking, that is NFC, has not yet been investigated systematically together with established motivational indicators, especially in longitudinal studies, or integrated into models for the prediction of performance in school.

Only last year, a large longitudinal study examined intelligence, the Big Five, a range of different motivational measures together with NFC in order to determine their value in predicting school performance (Lavrijsen, Vanstennkiste, Boncquet, & Verschueren, 2021). Their results showed intelligence and NFC to be the strongest predictors of school performance. The ability self-concept was the best predictor within the group of motivational variables. This underscores the importance to consider NFC along with established predictors when aiming at a comprehensive picture of the prediction of school grades.

To follow-up on these findings and to provide new insights in the interplay of school performance, NFC and motivational variables, we examined the incremental value of NFC, considering well-established motivational constructs as well as prior achievement in the prediction of school grades across different subjects in a longitudinal approach in a sample of secondary school children.

**2. Theoretical background**

**2.1. Achievement Motivation and its relation to school performance**

Achievement motivation is operationalized through various variables and can be seen as an essential predictor of academic achievement (e.g., Hattie, 2009; Steinmayr & Spinath, 2009; Wigfield & Cambria, 2010). Well-established concepts such as ability self-concepts, hope for success and fear of failure, or variables such as interests and values can be found under this umbrella term (Steinmayr et al., 2019). They have found their way into essential models of ??? (e.g., Wigfield, & Eccles, 2000; Kriegbaum et al., 2018), which is why they were included in this study as important motivational indicators. They are briefly introduced below.

*Ability Self-concepts.* Ability self-concepts can be described as generalized or subject-specific ability perceptions that students acquire on the basis of competence experiences in the course of their academic life (Möller & Köller, 2004). They thus reflect cognitive representations of one’s level of ability (Marsh, 1990). Such ability perceptions of students affect their academic performance (e.g., Wigfield & Eccles, 2000). A meta-analysis found moderate correlations with academic achievement (r = .34; Huang, 2011), whereas the association was lower (r ~ .20) when controlled for prior achievement (e.g., Marsh & Martin, 2011). Steinmayr et al. (2019) demonstrated that among several motivational indicators, domain-specific ability self-concepts were the strongest predictors of school performance. Moreover, ability self-concepts and school performance influence each other and can thus mutually reinforce or weaken each other (e.g., Guay et al., 2003).

*Hope for Success/Fear of Failure*. Murray (1938) considered the Need for Achievement as one of the basic human needs and as a relatively stable personality trait. His concept was extended by McClelland, Atkinson, Clark, and Lowell (1953), who differentiated the achievement motives hope for success (the belief of being able to succeed accompanied by the experience of positive emotions) and fear of failure (worry about failing in achievement situations and the experience of negative emotions). Such affective tendencies in the context of achievement motivation are reflected, for instance, in the choice of task difficulty, affinity for risk, and quality of task completion (Diseth & Martinsen, 2003). Hope for success may facilitate knowledge acquisition, whereas fear of failure may impede it (Diseth & Martinsen, 2003). A meta-analysis found achievement motivation in the sense of hope for success weakly to moderately positively related to academic achievement (r = .26; Robbins et al., 2004). For the association of fear of failure and academic achievement, findings from individual studies suggest a relationship of similar magnitude but in a different direction (e.g., r = -.26; Dickhäuser et al., 2016).

*Task values - Interest*. Another important motivational indicator that was also included in the influential model of Wigfield and Eccles (2000), describes task values. Such task values focus on importance, perceived utility, and interest in a task (cf. Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Specifically on the domain of interest, a number of papers are available on the relationship with school performance, with correlations being in a low to moderate range (for an overview, see Steinmayr et al., 2019). A meta-analysis on the relationship between interest and achievement found moderate positive correlations between these two variables (Schiefele, Krapp, & Winteler, 1992).

**2.2 Need for Cognition and academic performance**

Need for Cognition (NFC) describes the stable intrinsic motivation of an individual to engage in and enjoy challenging intellectual activity (Cacioppo, Petty, Feinstein & Jarvis, 1996). While individuals with lower NFC scores tend to rely more on other people, cognitive heuristics or social comparisons, individuals with higher NFC scores show a tendency to seek, acquire and reflect on information (Cacioppo et al., 1996). NFC has been shown to be rather modestly related to intelligence and its fluid (Fleischhauer et al., 2010) and crystallised (von Stumm & Ackerman, 2013) components, mirroring the typical cognitive performance of a person.

Concerning academic performance correlates with NFC across different stages of school and university : For example, low to medium correlations were found for NFC and average grades at the university (for meta-analytical reviews see Richardson, Abraham & Bond, 2012; von Stumm & Ackerman, 2013). A similar picture emerges for the correlation of NFC and university entrance tests (Cacioppo & Petty, 1982; Olson, Camp, & Fuller, 1984; Tolentino, Curry, & Leak, 1990). In terms of school performance, Preckel (2014) reports a weak positive correlation primarily for the subject of maths in secondary school. Ginet and Py (2000) found a mean correlation of r = .33 between NFC and school performance across all school years studied, with lower correlations in earlier and higher in later school years, a pattern that can also be found in Luong et al. (2017). Colling and colleagues (2021) also report differences in the strength of the correlations with school performance, here depending on the type of school, with the correlations between NFC and performance being strongest in the highest and weakest in the lowest track of school.

Concerning the interplay of intelligence und NFC in the context of school performance, Strobel, Behnke, Gärtner, and Strobel (2019) found that reasoning ability and NFC both significantly predicted higher grade point average (GPA). Interestingly, NFC also moderated the relation between intelligence and GPA: at higher levels of NFC, the relation of reasoning ability and GPA was diminished. Although this finding requires independent replication, it could point to a potentially compensating effect of NFC.

**2.3 NFC and motivational aspects of learning**

The increased willingness to invest mental effort and attention in task and information processing that is typical for individuals with higher NFC is also associated with positive correlations to various traits, behaviours and indicators relevant to learning. Evans, Kirby, and Fabringar (2003) found associations of NFC with deeper processing while learning. Dickhäuser and Reinhard (2010) reported strong associations of NFC with the general ability self-concept and smaller correlations with subject-specific ability self-concepts. Luong et al. (2017) not only reported moderate to high correlations of NFC with aspects of the ability self-concept, but also with learning orientation, processing depth and the desire to learn from mistakes. Preckel (2014) found medium correlations of NFC with learning goals and interest in various school subjects (for the latter association, see also Keller et al., 2016). Furthermore, Elias and Loomis (2002) found NFC and efficacy beliefs to be moderately correlated. Their results suggested that the relationship between NFC and GPA was mediated by efficacy beliefs, in a way that individuals with higher NFC had higher efficacy belief which in turn had a positive effect on academic performance. Diseth and Martinsen (2003) examined another indicator of performance motivation: In a student sample, they found a high positive correlation between NFC and hope for success and a medium negative relationship between NFC and fear of failure. Comparable findings are also reported by Bless, Wänke, Bohner, Fellhauer, and Schwarz (1994). In a large sample of 7th grade students, Lavrijsen et al. (2021) found a strong correlation with performance motivation and no relation of NFC to fear of failure.

Several studies examined NFC along with other motivational variables and could show NFC to explain variance in academic performance beyond established motivational characteristics such as learning orientation or academic self-concept (Keller et al., 2016; Luong et al., 2017). Meier, Vogl, and Preckel (2014) examined potential predictors of the attendance of a gifted class. They found that NFC, compared to other motivational constructs like academic interests and goal orientations, significantly predicted the attendance of a gifted class even when controlling for cognitive ability and other factors like parental education level or academic self-concept. Lavrijsen et al. (2021) examined the predictive value of intelligence, personality (Big Five and NFC) and different motivational constructs for school performance and found intelligence, NFC and the ability self-concept to be the most strongest predictors of math grades and performance in standardized math tests.

**2.4 The present study**

All in all, NFC has been proven to be a very promising predictor of school performance over and above other motivational constructs. Yet, so far the evidence on its incremental predictive value is limited by the mainly cross-sectional nature of available studies and by the fact that only a few school subjects were considered. Furthermore, up to now, prior achievement was not integrated as performance predictor in studies examining NFC. This is a limitation insofar as besides students’ cognitive abilities their prior achievement could be shown to be a relevant predictor of academic performance (e.g., Hailikari et al., 2007, Steinmayr et al., 2019).

With the present study, we aim at adding to the existing body of research by examining NFC, motivational indicators (ability self-concept, hope for success and fear of failure, interests, each of them general and subject-specific) and school grades (GPA, German, math, physics, and chemistry) at two points of time. By applying latent change score modelling, we will be able to determine the influence of our different predictors on the change of school performance over time. At the same time, mutual influences of changes in school performance, NFC and motivational constructs can be detected (i.e., correlated change). We examine the following hypotheses and research questions:

1. What is the incremental value of Need for Cognition in the prediction of school performance over and above different motivational constructs and prior achievement in school?
2. Is Need for Cognition able to predict changes in school achievement over time?
3. Are changes in motivational variables, Need for Cognition and school performance related over time?

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