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Need for cognition in children and adolescents: Behavioral correlates and relations to academic achievement and potential

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ABSTRACT

The investment trait need for cognition (NFC) is conceptualized as the intrinsic motivation to engage in and enjoy effortful cognitive endeavors. Higher NFC levels have been shown to be related to a deeper elaboration of information, better performance on cognitive exercises, and more effective complex problem solving, moreover NFC has shown only a moderate relation to (fluid) aspects of intelligence. Surprisingly, NFC has rarely been investigated in school contexts even though all of the aspects listed above are highly relevant for learning and school performance. Here, we present empirical results from a comprehensive collaborative study of 4279 Finnish students (from the 3rd, 6th and 9th grade; 10 to 16 years of age) assessed with an NFC scale for children. We observed moderate positive correlations between NFC and behavioral correlates related to learning (ability self-concept, control motivation, learning orientation) for all three grade levels. Furthermore, the analyses revealed no relations between NFC and academic achievement or potential in Grade 3, but positive relations in Grades 6 and 9. The findings accentuate the importance of NFC in educational contexts and suggest a growing influence of NFC over the school-years.

1. Introduction

In this article, we address the investment trait need for cognition (NFC), which reflects the enjoyment of thinking (Cacioppo & Petty, 1982), and its importance for learning and school performance. According to the Investment Theory (Ackerman & Heggestad, 1997), personality traits such as NFC determine how individuals invest their cognitive resources and how they deal with cognitively challenging material. Whereas intelligence is usually the first construct to come to mind as a crucial predictor of academic performance, the relevance of the motivation to invest cognitive resources and the derivation of pleasure from doing so has not been considered to the same degree (von Stumm, Hell, & Chamorro-Premuzic, 2011). It is reasonable to address this topic more closely as the importance of motivational aspects in learning matters is widely discussed (Wigfield & Eccles, 2000) and cognitive motivation should be of particular relevance. On the other hand, intrinsic motivation is reported to decrease over school years (e.g. Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Spinath & Steinmayr, 2008), which in turn indicates changes of its influence regarding learning-relevant variables (Ackerman & Heggestad, 1997). These findings support the notion that fostering cognitive motivation especially in early years of academic development might be of particular relevance for sustaining learning motivation. Since NFC as one indicator of cognitive motivation has not been comprehensively addressed for younger students yet, the aim of this article is to introduce NFC in the context of learning in children between the ages of 8 and 18, attending Grades 3, 6 and 9, by highlighting the value of NFC regarding academic achievement, its relations to academic potential, and its relevant learning-related behavioral correlates.

We examined data from 4279 Finnish students and focused on two main research questions. First we were interested in how NFC would be linked to aspects of learning, and academic achievement or potential in children and adolescents in Grades 3, 6, and 9. Second, we investigated whether NFC would contribute to the explanation of academic achievement over and beyond school-related motivational variables.

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2. Theoretical framework

When researchers investigate the human mind, it is possible to address cognition from different perspectives. Thereby, it is relevant not only to consider maximum cognitive performance as assessed with cognitive tests but also to include personality traits that can account for the amount of cognitive effort that is typically invested (Ackerman & Heggestad, 1997). One trait that fits this purpose is NFC, which is defined as "a stable individual difference in people's tendency to engage in and enjoy effortful cognitive activity" (Cacioppo, Petty, Feinstein, & Jarvis, 1996, p. 197, see also Cacioppo & Petty, 1982). This definition of NFC stresses the particular relevance of its relation to cognitive performance in academic and school environments (Furnham & Thorne, 2013) because NFC emphasizes the *enjoyment* of being involved in cognitive activities and the *desire* to deal with them intensively, rather than merely being involved in them (Cacioppo & Petty, 1982).

Meta-analyses have identified intelligence (Poropat, 2009), conscientiousness (e.g., Poropat, 2009) and ability self-concept (Richardson, Abraham, & Bond, 2012; Robbins et al., 2004) as important predictors of academic achievement. The meta-analyses of Richardson et al. (2012) found NFC to be the third strongest non-intellective predictor for tertiary GPA (besides procrastination and conscientiousness). Although the enjoyment of engaging in cognitive tasks has been suggested to be relevant to learning and academic achievement (Wigfield & Eccles, 2000), this has not yet been investigated systematically or integrated into the respective models of primary or secondary education.

2.1. Learning-related behavioral correlates of need for cognition

The high potential of NFC for predicting learning and academic achievement is accentuated by its behavioral correlates. Petty and Cacioppo (1986) embedded NFC in the Elaboration Likelihood Model, which assumes two routes for information processing. Whereas individuals high in NFC elaborate information using a more profound *central* route, individuals low in NFC tend to process information more casually, in a *peripheral* way (Petty & Cacioppo, 1986). In line with these ideas, individuals high in NFC were found to show a more active, widespread, and motivated search for new information (e.g., Verplanken, Hazenberg, & Palenewen, 1992), to think about the arguments and behavior of other people more profoundly (Latimer, Katulak, Mowad, & Salovey, 2005), and to enjoy solving difficult problems over easier ones (Cacioppo & Petty, 1982). Concerning learning in academic contexts, NFC was found to be strongly related to deeper approaches to learning (Evans, Kirby, & Fabringar, 2003) and general ability self-concept (Dickhäuser & Reinhard, 2010), and moderately related to mastery goals and interest in school subjects (Preckel, 2014).

On a more general level, motivational variables were found to develop in early school-years. In elementary school, a decrease of intrinsic motivation and competence beliefs was shown (Spinath & Steinmayr, 2008). For most school subjects the decrease continued until the students' age of 16. However, for some school subjects an increase of motivational variables was reported (Jacobs et al., 2002). Beyond that, individual differences were observed, highlighting that some children are in higher risk to lose their motivation to learn than others (Spinath & Steinmayr, 2008). Spinath and Steinmayr (2008) discussed that in order to keep the motivation to learn it is more important for students to focus on their own individual learning process (e.g., that own effort leads to better results) rather than on the outcome of a specific task or school subject. This is why the consideration of NFC is of special interest, since individuals high in NFC enjoy effortful cognitive activities and therewith the process of thinking and do not only focus on the outcome.

2.2. Need for cognition and intelligence

To succeed in academic contexts, different preconditions should be met. A main aspect is the academic potential as, generally spoken, the ability to deal with conceptual, more abstract problems and to think critical, that is, to be able to solve the tasks in an academic environment. An essential aspect of academic potential is intelligence. Two studies embedded NFC into broader intelligence models. Fleischhauer et al. (2010) reported small to moderate correlations between NFC and fluid intelligence (Gf) but no significant relation between NFC and crystallized aspects of intelligence (Gc). Individuals with higher NFC did not solve more tasks but worked more accurately in general, hence suggesting that individuals with a higher NFC put greater cognitive effort into a single task than individuals with lower NFC (Fleischhauer et al., 2010). Hill et al. (2013) found moderate positive correlations for both Gf and Gc, proposing that because individuals with high NFC often engage in cognitive activities, they have developed stronger cognitive skills, helping them to do well in both fluid and crystallized intelligence tasks (Hill et al., 2013). A meta-analysis identified a correlation of about $r = 0.30$ for NFC and Gc (von Stumm & Ackerman, 2013). There is only one study on the association between NFC and intelligence in children: Preckel (2014) reported small positive correlations between NFC and intelligence in 5th and 6th graders. Broader investigations of NFC and intelligence in children and adolescents are lacking.

2.3. Need for cognition and academic achievement

The few studies that have broached the issue of NFC and academic achievement have mainly examined college students and have reported small to moderate correlations between NFC and grade point average (meta-analytic results: $r = 0.19$ to 0.28; Richardson et al., 2012; von Stumm & Ackerman, 2013). Similar results have been found for the relation between NFC and college entry tests ($r = 0.34$ to 0.39; e.g., Cacioppo & Petty, 1982; Tolentino, Curry, & Leak, 1990). Currently, there are only two studies that have addressed the relation between NFC and academic achievement in younger students. Preckel (2014) reported small positive correlations between NFC and math grade ($r = 0.10$ to 0.24) in 5th and 6th graders. For other school subjects, a positive but nonsignificant relation with NFC was found. Ginet and Py (2000) found a moderate relation ($r = 0.33$) between NFC and grades across all grade levels in primary school students (ages 10 to 13). Whereas for the lower grade level (about 10 years of age), the correlation was small and nonsignificant ($r = 0.10$), for the higher grade levels (11 to 13 years of age), the correlation was strong and significant ($r = 0.42$ to 0.50). In addition, low NFC was shown to be a predictor of underachievement in school for students in Grades 7 to 10 (Preckel, Holling, & Vock, 2006).

2.4. Aim of the present research

Higher NFC is related to a deeper elaboration of information, greater motivation to search for new information, and the enjoyment of solving difficult tasks rather than easier ones. It is only modestly related to intelligence or academic potential, respectively. There are only a few studies that have examined the relation between NFC and academic achievement especially for younger schoolchildren (e.g., Preckel, 2014; Preckel et al., 2006).

The mediate relations of NFC and intelligence and the findings regarding NFC and academic achievement indicate that NFC is a promising candidate for predicting learning related behavior and academic achievement and suggest that the influence of NFC might change over the school years. Beyond that, motivational variables were shown to be modifiable in early school years, so it may be possible to positively influence NFC in younger students. Even though existing research on adults illustrates the importance of NFC in learning contexts, it has not been systematically empirically embedded in the context of schoolchildren.

For these reasons, we assessed data from $N = 4279$ Finnish students attending grades 3, 6, and 9 and examined the role of NFC within the nexus of established cognitive and non-cognitive constructs using a newly developed NFC scale for children (NFC-KIDS; Preckel & Strobel,