1    Need for Cognition and Ability Self-Concepts as Predictors of Changes in School Grades

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$$\text{Abstract}$$

...

*Keywords:* Need for Cognition, Grades, Academic Self-Concept, Latent Change Score

Modeling, Longitudinal

Word count:

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19        . . .

## Methods

21        We report how we determined our sample size, all data exclusions, all manipulations,

22    and all measures in the study (cf. Simmons, Nelson, & Simonsohn, 2012). All data and

23    materials for reproducing our analyses are permanently and openly accessible at . . . The

24    study was not preregistered.

### Participants

26        Sample size was determined by pragmatic considerations, i.e., to collect as many

27    participants given existing time constraints and the longitudinal nature of the project. We

28    eventually managed to recruit a sample of $N = 277$ participants (60% women) at the first

29    measurement occasion (T1) of which $N = 251$ participants (61% women) also took part at

30    the second measurement occasion (T2) that took place 53-59 weeks later. Age range was

31    14-19 years (median $=$ 17 years) at T1 and 15-20 years (median $=$ 18 years) at T2. With

32    the sample size accomplished at T2, we were able to detect correlations of $r \geq .18$ at $\alpha =$

33    .05 (two-sided) and 1-$\beta = .80$. Yet, we tried to impute missing values to raise power (see

34    below, *Statistical analyses*).

### Material

36        We used the following self-report measures to assess the measures of interest for the

37    present study.

38        *School Grades* in general, i.e., Grade Point Average (GPA), and grades in German,

39    math, chemistry, and physics were assessed via self-report. In Germany, school grades

40 range from 1 (excellent) to 6 (insufficient). For better interpretability, we reversed this

41 coding via $6 - grade$, so the values we used for statistical analyses ranged from 0

42 (insufficient) to 5 (excellent).

43    *Need for Cognition* (NFC) was assessed with the 16-item short version of the German

44 NFC scale (Bless, Wänke, Bohner, Fellhauer, & Schwarz, 1994). Responses to each item

45 (e.g., "Thinking is not my idea of fun", recoded) were recorded on a four-point scale

46 ranging from -3 (completely disagree) to +3 (completely agree) and were summed to the

47 total NFC score. The scale has a comparably high internal consistency, Cronbach's $\alpha > .80$

48 (Bless et al., 1994; Fleischhauer et al., 2010), and retest reliability, $r_{tt} = .83$ across 8 to 18

49 weeks (Fleischhauer, Strobel, & Strobel, 2015).

50    *Hope for Successs* and *Fear of Failure* were assessed using the Achievement Motive

51 Scales (Gjesme & Nygard, 2006; German version: Göttert & Kuhl, 1980). For the present

52 study, we used a short form measuring each construct with seven items. All items were

53 answered on a four-point scale ranging from 1 (does not apply at all) to 4 (fully applies).

54 Example items for the two scales are "Difficult problems appeal to me" and "Matters that

55 are slightly difficult disconcert me". Both scales exhibit high internal consistencies,

56 Cronbach's $\alpha \geq .85$ (Steinmayr & Spinath, 2009).

57    The *Ability Self-Concept* in school in general and in the four subjects German, math,

58 physics, and chemistry were assessed with four items per domain using the Scales for the

59 Assessment of Academic Self-Concept (Schöne, Dickhäuser, Spinath, & Stiensmeier-Pelster,

60 2002) (example item: "I can do well in . . . (school, math, German, physics, chemistry).").

61 Items were answered on a 5-point scale ranging from 1 () to 5 (). The scales' internal

62 consistency, Cronbach's $\alpha \geq .80$, and retest reliability, $r_{tt} \geq .59$ across six months, can be

63 considered as high.

64    *Interest* in school in general and in the above four subjects were measured using

65 Interest subscales of the Scales for the Assessment of Subjective Values in School

66  (Steinmayr & Spinath, 2010). Answers to three items per domain (example item: "How

67  much do you like ... (school, math, German, physics, chemistry).") were recorded on a

68  5-point scale ranging from 1 () to 5 (). The scales have high internal consistency,

69  Cronbach's $\alpha \geq .89$, and retest reliability, $r_{tt} = .72$ across six months (Steinmayr &

70  Spinath, 2010).

## Procedure

72      ...

## Statistical analysis

74      We used *RStudio* [Version 2021.9.0.351; RStudio Team (2016)] with R (Version 4.1.1;

75  R Core Team, 2018) and the R-packages *lavaan* (Version 0.6.10; Rosseel, 2012), *psych*

76  (Version 2.1.9; Revelle, 2018), and *pwr* (Version 1.3.0; Champely, 2018). This manuscript

77  was created using RMarkdown with the packages *papaja* [Version 0.1.0.9997; Aust and

78  Barth (2018)], *knitr* [Version 1.37; Xie (2015)], and *shape* [Version 1.4.6; Soetaert (2021)].

79      First the variables were separated into four sets, each containing the T1 and T2

80  measurements of the variables Hope for Success (HfS), Fear of Failure (FoF), and Need for

81  Cognition (NFC) as well as either GPA, overall ability self-concept regarding school, and

82  general interest in school, or domain-specific grades, ability self-concept and interest in

83  German, math, physics, and chemistry. All measures were initially analyzed with regard to

84  descriptive statistics, reliability (retest-reliability $r_{tt}$ as well as Cronbach's $\alpha$), and possible

85  deviation from univariate and multivariate normality. Almost all relevant variables

86  deviated from univariate normality as determined using Shapiro-Wilks tests with a

87  threshold of $\alpha = .20$, all $p \leq .089$ except for NFC at T2, $p = .461$. Also, there was

88  deviation from multivariate normality as determined using Mardia tests, all $p_{skew}$ and

89  $p_{kurtosis} < .001$. Therefore, we used more robust variants for the statistical tests to be

performed, i.e., Spearman rank correlations ($r_s$) for correlation analyses and Robust

Maximum Likelihood (MLR) for regression analyses and latent change score modeling.

   Possible differences between the measurement occasions T1 and T2 were descriptively

assessed via boxplots, with overlapping notches—that can roughly be interpreted as 95%

confidence intervals of a given median—pointing to noteworthy differences. Otherwise

differences between time points were not considered further given the scope of the present

report. Correlation analyses were performed separately for the five sets of data (see Table 1

and Supplementary Tables S1 to S4). Where appropriate, evaluation of statistical

significance was based on 95% confidence intervals (CI) that did not include zero.

Evaluation of effect sizes of correlations was based on the empirically derived guidelines for

personality and social psychology research provided by Gignac and Szodorai (2016), i.e.,

correlations were regarded as small for $r < .20$, as medium for $.20 \leq r \leq .30$, and as large

for $r > .30$.

   To examine which variables measured at T1 would be significant predictors of school

grades at T2, we ran a five regression analyses with the GPA and the four subject-specific

grades as criterion and used the results of the first regression analysis (with the

domain-general Ability Self-Concept, Interest in School, Hope for Success and Fear of

failure, and NFC measured at T1 as predictors and GPA at T2 as criterion) to select the

variables for latent change score modeling. Significant predictors in this model were used

for all latent change score models even if for certain subjects, the predictors were not

significant in the respective regression models. Regression models were fitted via *lavaan*,

using MLR as estimation technique and the Full-Information Maximum Likelihood (FIML)

approach to impute missing values. Due to missing patterns, this resulted in an effective

sample size of $N = 271\text{-}276$. To asses whether a model that included NFC was superior to

a model that included established predictors of academic achievement, we (1) evaluated the

fit of the respective models based on the recommendations by Hu and Bentler (1999), with

values of CFI $\geq .95$, RMSEA $\leq .06$, and SRMR $\leq 0.08$ indicating good model fit, and (2)

117  performed $\chi^2$-difference tests between the former and the latter model (and all other

118  variables' loadings fixed to zero).

119       In the final step, latent change score modeling was applied. In this approach (see

120  Kievit et al., 2018), one can examine (1) whether true change in a variable has occurred via

121  a latent change score that is modeled from the respective measurements of this variable at

122  different measurement occasions, here T1 and T2, (2) to what extent the change in a

123  variable is a function of the measurement of the *same* variable at T1 (self-feedback) and (3)

124  to what extent the change in this variable is a function of the measurement of *other*

125  variables in the model at T1 (cross-domain coupling). Thereby, cross-domain effects, i.e.,

126  whether the change in one domain (e.g., school grades) is a function of the baseline score of

127  another (e.g., NFC) and vice versa could be examined. In addition, correlated change in

128  the variables of interest can be examined, i.e., to what extent does the change in one

129  variable correlate with the change in another variable. Again, MLR estimation and

130  imputation of missing values via FIML was employed.


131                                      **Results**


132  **Domain-general grades**


133       Table 1 gives the descriptive statistics and intercorrelations of the variables of interest

134  in this analysis step, i.e., the T1 and T2 measurements of GPA, domain-general ability

135  self-concept, and general interest in school as well as the variables Hope for Success, Fear of

136  Failure, and NFC. As can be seen in the diagonal and the upper right of the correlation

137  table, all variables exhibited good internal consistency, Cronbach's $\alpha \geq .83$, and retest

138  reliability, $r_{tt} \geq .56$. Among the predictors at T1, GPA at T1 showed the strongest relation

139  to GPA at T2, $r_s = .75$, followed by the domain-general ability self-concept, $r_s = .53$, and

140  NFC at T1, $r_s = .46$, all $p < .001$. The other variables at T1 showed significant correlations

141  with GPA at T2 as well, $|r_s| \geq .20$, $p \leq .004$.

142     A multiple regression analysis involving all measures at T1 (see Table 2) showed that

143  apart from GPA at T1, $B = 0.61$, 95% CI [0.49, 0.73], $p < .001$, the only significant

144  predictors were the domain-general ability self-concept, $B = 0.12$, 95% CI [0.01, 0.22],

145  $p = .031$, and NFC, $B = 0.09$, 95% CI [0.01, 0.17], $p = .024$. Model fit was better for a

146  model that included GPA, the ability self-concept, and NFC at T1 (while all other

147  predictors were set to zero), $\chi^2(3) = 3.68$, $p$ .299, CFI $= 1.00$, RMSEA $= .03$ with 90% CI

148  [0.00, 0.11], SRMR $= .01$, than a model that included GPA and the ability self-concept

149  only, $\chi^2(4) = 10.91$, $p$ .028, CFI $= 0.96$, RMSEA $= .08$ with 90% CI [0.02, 0.14], SRMR $=$

150  .02, and a $\chi^2$-difference test supported the superiority of the former compared to the latter

151  model, $\chi^2(1) = 6.34$, $p = .012$.

152     We therefore further examined a trivariate latent change score model involving school

153  grades, the ability self-concept, and NFC. Figure 1B gives the results of the latent change

154  score modeling with regard to the prediction of change and correlated change in overall

155  school grades, i.e., GPA. While the best predictor of change on GPA was GPA at T1 (i.e.,

156  self-feedback), $B = -0.37$, 95% CI [-0.48, -0.25], $p < .001$, $\beta = -.55$, there was also evidence

157  for cross-domain coupling, as the overall ability self-concept and NFC at T1 also

158  significantly predicted change in GPA, $B = 0.13$, 95% CI [0.02, 0.24], $p = .020$, $\beta = .19$,

159  and $B = 0.08$, 95% CI [0.02, 0.15], $p = .009$, $\beta = .19$, respectively. Correlated change was

160  observed for GPA and the ability self-concept, $B = 0.03$, 95% CI [0.01, 0.05], $p = .001$, $\beta =$

161  .22, and the ability self-concept and NFC, $B = 0.05$, 95% CI [0.02, 0.08], $p$ .001, $\beta = .22$,

162  while the correlated changes in GPA and NFC did not reach significance, $B = 0.03$, 95% CI

163  [0.00, 0.05], $p = .053$, $\beta = .14$.

164  **Domain-specific grades**

165     For the four subjects examined, i.e., German, math, physics, and chemistry, similar

166  results were obtained with regard to correlation analyses (see Supplementary Tables Sx to

167  Sy). As regards multiple regression analyses (see Supplementary Table Sz), for all subjects,

grades at T2 were significant predictors of grades at T2, $p < .001$. The subject-specific ability self concept at T1 was a significant predictor of grades at T2 in German only, $B = 0.29$, 95% CI [0.15, 0.43], $p < .001$. NFC at T1 was a significant predictor of T2 grades in German, $B = 0.18$, 95% CI [0.05, 0.32], $p = .007$ and physics, $B = 0.22$, 95% CI [0.07, 0.37], $p = .004$.

As regards the latent change score models, there was evidence for significant self-feedback for all subjects, all $p < .001$. With regard to the subject-specific ability self-concept, cross-domain coupling with changes in grades was observed for German, $B = 0.28$, 95% CI [0.16, 0.40], $p < .001$, $\beta = .36$, and chemistry, $B = 0.09$, 95% CI [0.00, 0.18], $p = .042$, $\beta = .14$. NFC at T1 showed cross-domain coupling with grades at T2 for German, $B = 0.13$, 95% CI [0.04, 0.21], $p = .005$, $\beta = .17$, physics, $B = 0.23$, 95% CI [0.13, 0.33], $p < .001$, $\beta = .24$, and chemistry, $B = 0.10$, 95% CI [0.00, 0.20], $p = .047$, $\beta = .13$. Correlated change between grades and the subject-specific ability self-concept was observed for all subjects, while correlated change between grades and NFC was observed for German, math, and physics only (see Fig. 1C-F).

# Discussion

The present study was conducted in order to ...

## Subheading 1

Our result show that ...

## Subheading 2

...

189 **Conclusion**

190 Taken together, the present study provides evidence that . . .

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Table 1

*Spearman correlations and descriptive statistics of the variables in the analyses on overall school grades*

| | GRD1 | ASC1 | INT1 | HFS1 | FOF1 | NFC1 | GRD2 | ASC2 | INT2 | HFS2 | FOF2 | NFC2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRD1 | — | .58 | .38 | .34 | -.24 | .44 | ***.75*** | .52 | .34 | .40 | -.23 | .49 |
| ASC1 | | *.83* | .49 | .37 | -.27 | .38 | .50 | ***.60*** | .32 | .34 | -.18 | .26 |
| INT1 | | | *.88* | .32 | -.09 | .35 | .44 | .47 | ***.65*** | .31 | -.05 | .26 |
| HFS1 | | | | *.86* | -.30 | .62 | .32 | .38 | .26 | ***.57*** | -.17 | .50 |
| FOF1 | | | | | *.88* | -.42 | -.17 | -.28 | -.14 | -.29 | ***.59*** | -.43 |
| NFC1 | | | | | | *.89* | .46 | .43 | .25 | .62 | -.32 | ***.71*** |
| GRD2 | | | | | | | — | .53 | .34 | .41 | -.18 | .48 |
| ASC2 | | | | | | | | *.84* | .53 | .45 | -.25 | .46 |
| INT2 | | | | | | | | | *.88* | .31 | -.05 | .34 |
| HFS2 | | | | | | | | | | *.87* | -.28 | .66 |
| FOF2 | | | | | | | | | | | *.90* | -.39 |
| NFC2 | | | | | | | | | | | | *.89* |
| Mean | 3.30 | 3.55 | 3.25 | 2.92 | 1.86 | 4.46 | 3.46 | 3.62 | 3.41 | 2.72 | 1.71 | 4.69 |
| SD | 0.55 | 0.54 | 0.83 | 0.57 | 0.61 | 0.84 | 0.52 | 0.56 | 0.82 | 0.56 | 0.61 | 0.87 |
| Min | 2.00 | 1.75 | 1.00 | 1.14 | 1.00 | 2.19 | 2.10 | 2.25 | 1.00 | 1.00 | 1.00 | 2.50 |
| Max | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 6.94 | 5.00 | 5.00 | 5.00 | 4.00 | 3.71 | 6.88 |
| Skew | 0.17 | 0.09 | -0.27 | -0.23 | 0.45 | 0.16 | 0.31 | 0.33 | -0.21 | -0.02 | 0.89 | 0.07 |
| Kurtosis | -0.09 | 0.24 | -0.37 | -0.07 | -0.34 | 0.14 | -0.11 | -0.14 | -0.42 | 0.17 | 0.47 | -0.45 |

*Note.* $N = 193\text{-}259$ due to missings; $p < .05$ for $|r_s| > .18$; coefficients in the diagonal are Cronbach's $\alpha$, bold-faced coefficients give the 53-59 week retest reliability; GRD = Grade Point Average, ASC = Overall Ability Self-Concept, INT = Overall Interest in School, HFS = Hope for Success, FOF = Fear of Failure, NFC = Need for Cognition at measurement occasion 1, and 2, respectively

Table 2

*Results of the multiple regression of school grades measured at T2 on predictors measured at T1*

|  | $B$ | $SE$ | $CI.LB$ | $CI.UB$ | $\beta$ | $p$ |
|---|---|---|---|---|---|---|
| Intercept | 0.488 | 0.231 | 0.034 | 0.941 | .906 | .035 |
| GPA | 0.606 | 0.061 | 0.485 | 0.726 | .616 | $< .001$ |
| Ability Self-Concept | 0.116 | 0.054 | 0.010 | 0.222 | .117 | .031 |
| Interest | 0.057 | 0.031 | -0.005 | 0.118 | .087 | .072 |
| Hope for Success | -0.028 | 0.050 | -0.126 | 0.070 | -.029 | .578 |
| Fear of Failure | 0.013 | 0.039 | -0.063 | 0.089 | .015 | .733 |
| Need for Cognition | 0.089 | 0.040 | 0.012 | 0.167 | .140 | .024 |

*Note.* $N = 276$; coefficients are unstandardized slopes $B$ with their standard errors $SE$ and 95% confidence intervals ($CI.LB =$ lower bound, $CI.UB =$ upper bound), $\beta$ is the standardized slope and $p$ the respective $p$-vcalues
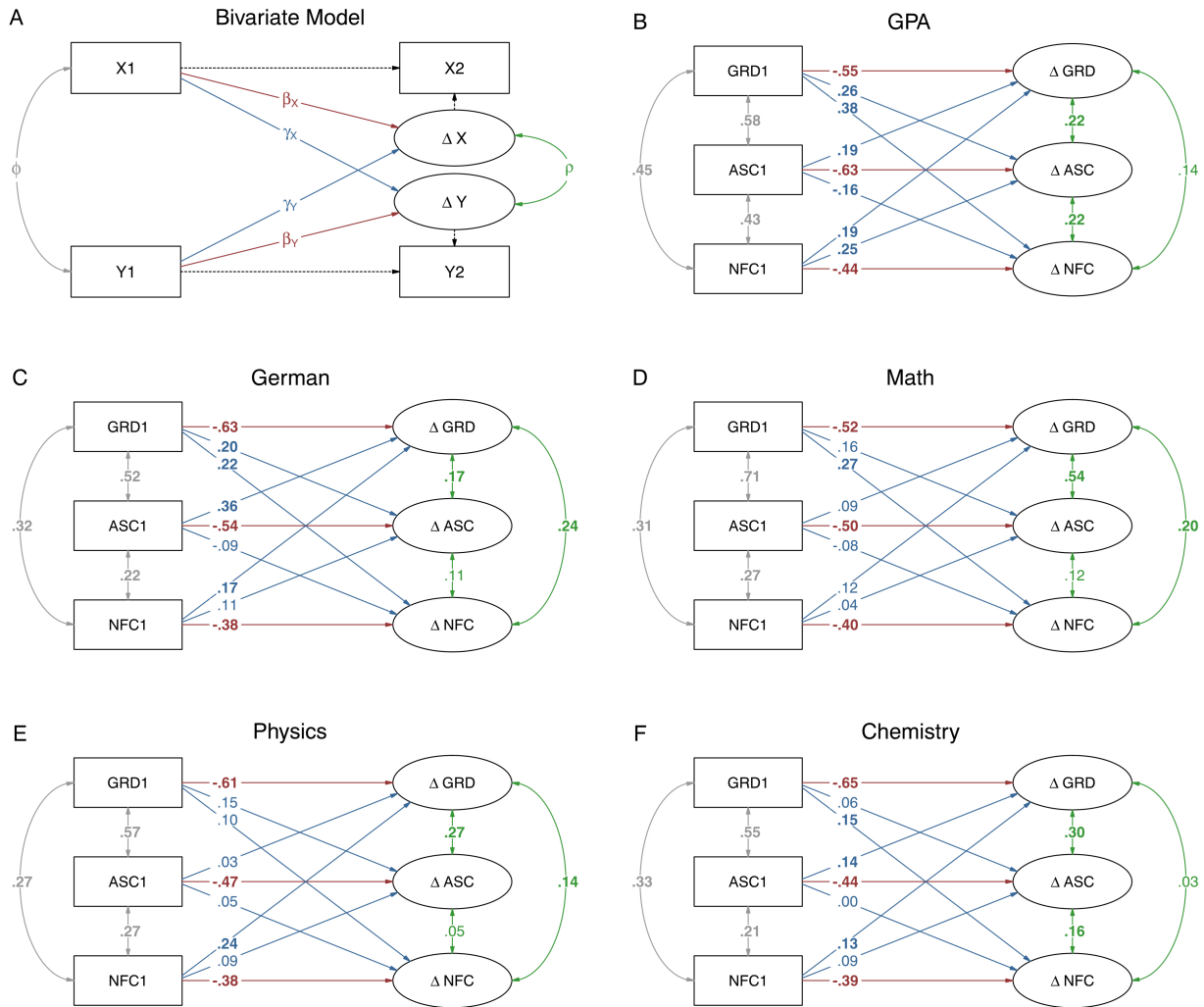
*Figure 1*. Latent change score models. (A) Example of a bivariate latent change score model (for details see text); legend to lines: dotted = loadings fixed to zero, red = self-feedback $\beta$, blue = cross-domain coupling $\gamma$, grey = correlation $\phi$ of predictors at T1, green = correlated change $\rho$; (B) Grade Point Average (GPA) and (C) to (F) subject-specific changes in grades at T2 (indicated by prefix $\Delta$) as predicted by their respective T1 levels as well as by Need for Cognition (NFC) and (overall as well as subject specific) Ability Self-Concept (ASC) at T1; coefficients are standardized coefficients.

253        Tables 1-4 provide the descriptives and intercorrelations of the variables involved in

254        the correlation analyses for the subjects German, math, physics, and chemistry. Table 5

255  gives the results of the multiple regression of grades at the second measurement occasion

256  (T2) on predictors measures at the first measurement occasion (T1). For details, see main

257  text.

[tbp]

Table 3

*Spearman correlations and descriptive statistics of the variables in the analyses on German grades*

|          | GRD1   | ASC1   | INT1   | HFS1   | FOF1   | NFC1   | GRD2   | ASC2   | INT2   | HFS2   | FOF2   | NFC2   |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| GRD1     | —      | .53    | .45    | .26    | -.17   | .33    | ***.67*** | .51    | .40    | .25    | -.18   | .35    |
| ASC1     |        | *.93*  | .66    | .16    | -.13   | .18    | .58    | ***.76*** | .60    | .08    | -.05   | .16    |
| INT1     |        |        | *.92*  | .16    | -.11   | .23    | .44    | .54    | ***.63*** | .17    | -.14   | .20    |
| HFS1     |        |        |        | *.86*  | -.30   | .62    | .21    | .16    | .11    | ***.57*** | -.17   | .50    |
| FOF1     |        |        |        |        | *.88*  | -.42   | -.20   | -.22   | -.13   | -.29   | ***.59*** | -.43   |
| NFC1     |        |        |        |        |        | *.89*  | .35    | .21    | .16    | .62    | -.32   | ***.71*** |
| GRD2     |        |        |        |        |        |        | —      | .58    | .46    | .24    | -.21   | .41    |
| ASC2     |        |        |        |        |        |        |        | *.92*  | .68    | .10    | -.13   | .25    |
| INT2     |        |        |        |        |        |        |        |        | *.91*  | .11    | -.06   | .19    |
| HFS2     |        |        |        |        |        |        |        |        |        | *.87*  | -.28   | .66    |
| FOF2     |        |        |        |        |        |        |        |        |        |        | *.90*  | -.39   |
| NFC2     |        |        |        |        |        |        |        |        |        |        |        | *.89*  |
| Mean     | 3.24   | 3.68   | 3.49   | 2.92   | 1.86   | 4.46   | 3.36   | 3.65   | 3.42   | 2.72   | 1.71   | 4.69   |
| SD       | 0.79   | 0.82   | 0.99   | 0.57   | 0.61   | 0.84   | 0.80   | 0.76   | 0.94   | 0.56   | 0.61   | 0.87   |
| Min      | 1.00   | 1.00   | 1.00   | 1.14   | 1.00   | 2.19   | 1.00   | 1.00   | 1.00   | 1.00   | 1.00   | 2.50   |
| Max      | 5.00   | 5.00   | 5.00   | 4.00   | 4.00   | 6.94   | 5.00   | 5.00   | 5.00   | 4.00   | 3.71   | 6.88   |
| Skew     | -0.01  | -0.38  | -0.33  | -0.23  | 0.45   | 0.16   | -0.13  | -0.26  | -0.26  | -0.02  | 0.89   | 0.07   |
| Kurtosis | -0.24  | -0.12  | -0.37  | -0.07  | -0.34  | 0.14   | -0.38  | 0.08   | -0.51  | 0.17   | 0.47   | -0.45  |

*Note.* $N$ = 221-259 due to missings; $p < .05$ for $|r_s| > .21$; coefficients in the diagonal are Cronbach's $\alpha$, bold-faced coefficients give the 53-59 week retest reliability; GRD = Grade German, ASC = Ability Self-Concept German, INT = Interest in German, HFS = Hope for Success, FOF = Fear of Failure, NFC = Need for Cognition at measurement occasion 1, and 2, respectively

[tbp]

Table 4

*Spearman correlations and descriptive statistics of the variables in the analyses on math grades*

| | GRD1 | ASC1 | INT1 | HFS1 | FOF1 | NFC1 | GRD2 | ASC2 | INT2 | HFS2 | FOF2 | NFC2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRD1 | — | .68 | .56 | .24 | -.17 | .30 | **.54** | .56 | .46 | .29 | -.11 | .34 |
| ASC1 | | *.95* | .79 | .26 | -.21 | .28 | .42 | **.73** | .58 | .38 | -.19 | .26 |
| INT1 | | | *.93* | .30 | -.19 | .35 | .38 | .66 | **.68** | .42 | -.20 | .31 |
| HFS1 | | | | *.86* | -.30 | .62 | .16 | .24 | .30 | **.57** | -.17 | .50 |
| FOF1 | | | | | *.88* | -.42 | -.21 | -.22 | -.18 | -.29 | **.59** | -.43 |
| NFC1 | | | | | | *.89* | .26 | .27 | .35 | .62 | -.32 | **.71** |
| GRD2 | | | | | | | — | .64 | .58 | .30 | -.12 | .40 |
| ASC2 | | | | | | | | *.95* | .80 | .37 | -.21 | .31 |
| INT2 | | | | | | | | | *.94* | .45 | -.17 | .42 |
| HFS2 | | | | | | | | | | *.87* | -.28 | .66 |
| FOF2 | | | | | | | | | | | *.90* | -.39 |
| NFC2 | | | | | | | | | | | | *.89* |
| Mean | 3.11 | 3.20 | 3.18 | 2.92 | 1.86 | 4.46 | 3.19 | 3.37 | 3.33 | 2.72 | 1.71 | 4.69 |
| SD | 1.02 | 1.01 | 1.14 | 0.57 | 0.61 | 0.84 | 1.10 | 0.98 | 1.10 | 0.56 | 0.61 | 0.87 |
| Min | 1.00 | 1.00 | 1.00 | 1.14 | 1.00 | 2.19 | 0.75 | 1.00 | 1.00 | 1.00 | 1.00 | 2.50 |
| Max | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 6.94 | 5.25 | 5.00 | 5.00 | 4.00 | 3.71 | 6.88 |
| Skew | -0.05 | -0.12 | -0.20 | -0.23 | 0.45 | 0.16 | -0.18 | -0.35 | -0.39 | -0.02 | 0.89 | 0.07 |
| Kurtosis | -0.63 | -0.65 | -0.88 | -0.07 | -0.34 | 0.14 | -0.61 | -0.39 | -0.61 | 0.17 | 0.47 | -0.45 |

*Note.* $N = 218\text{-}259$ due to missings; $p < .05$ for $|r_s| > .17$; coefficients in the diagonal are Cronbach's $\alpha$, bold-faced coefficients give the 53-59 week retest reliability; GRD = Grade Math, ASC = Ability Self-Concept Math, INT = Interest in Math, HFS = Hope for Success, FOF = Fear of Failure, NFC = Need for Cognition at measurement occasion 1, and 2, respectively

[tbp]

Table 5

*Spearman correlations and descriptive statistics of the variables in the analyses on physics grades*

| | GRD1 | ASC1 | INT1 | HFS1 | FOF1 | NFC1 | GRD2 | ASC2 | INT2 | HFS2 | FOF2 | NFC2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRD1 | — | .59 | .46 | .22 | -.13 | .27 | **.66** | .45 | .41 | .28 | -.13 | .28 |
| ASC1 | | *.95* | .80 | .17 | -.09 | .25 | .45 | **.65** | .65 | .32 | -.11 | .26 |
| INT1 | | | *.94* | .17 | -.08 | .23 | .36 | .64 | **.71** | .31 | -.18 | .23 |
| HFS1 | | | | *.86* | -.30 | .62 | .27 | .20 | .25 | **.57** | -.17 | .50 |
| FOF1 | | | | | *.88* | -.42 | -.10 | -.15 | -.13 | -.29 | **.59** | -.43 |
| NFC1 | | | | | | *.89* | .39 | .25 | .32 | .62 | -.32 | **.71** |
| GRD2 | | | | | | | — | .50 | .45 | .39 | -.15 | .41 |
| ASC2 | | | | | | | | *.96* | .85 | .35 | -.23 | .23 |
| INT2 | | | | | | | | | *.94* | .38 | -.19 | .29 |
| HFS2 | | | | | | | | | | *.87* | -.28 | .66 |
| FOF2 | | | | | | | | | | | *.90* | -.39 |
| NFC2 | | | | | | | | | | | | *.89* |
| Mean | 3.11 | 2.66 | 2.61 | 2.92 | 1.86 | 4.46 | 3.07 | 2.52 | 2.45 | 2.72 | 1.71 | 4.69 |
| SD | 1.03 | 0.99 | 1.16 | 0.57 | 0.61 | 0.84 | 0.93 | 1.03 | 1.19 | 0.56 | 0.61 | 0.87 |
| Min | 0.00 | 1.00 | 1.00 | 1.14 | 1.00 | 2.19 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 2.50 |
| Max | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 6.94 | 5.25 | 5.00 | 5.00 | 4.00 | 3.71 | 6.88 |
| Skew | -0.12 | 0.10 | 0.24 | -0.23 | 0.45 | 0.16 | -0.17 | 0.35 | 0.52 | -0.02 | 0.89 | 0.07 |
| Kurtosis | -0.24 | -0.70 | -0.90 | -0.07 | -0.34 | 0.14 | 0.14 | -0.50 | -0.69 | 0.17 | 0.47 | -0.45 |

*Note.* $N$ = 191-259 due to missings; $p < .05$ for $|r_s| > .13$; coefficients in the diagonal are Cronbach's $\alpha$, bold-faced coefficients give the 53-59 week retest reliability; GRD = Grade Physics, ASC = Ability Self-Concept Physics, INT = Interest in Physics, HFS = Hope for Success, FOF = Fear of Failure, NFC = Need for Cognition at measurement occasion 1, and 2, respectively

[tbp]

Table 6

*Spearman correlations and descriptive statistics of the variables in the analyses on physics grades*

| | GRD1 | ASC1 | INT1 | HFS1 | FOF1 | NFC1 | GRD2 | ASC2 | INT2 | HFS2 | FOF2 | NFC2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRD1 | — | .51 | .44 | .28 | -.25 | .32 | **.72** | .44 | .40 | .37 | -.23 | .35 |
| ASC1 | | *.96* | .82 | .23 | -.13 | .16 | .46 | **.70** | .62 | .21 | -.12 | .18 |
| INT1 | | | *.95* | .18 | -.03 | .18 | .39 | .67 | **.68** | .24 | -.10 | .19 |
| HFS1 | | | | *.86* | -.30 | .62 | .27 | .24 | .21 | **.57** | -.17 | .50 |
| FOF1 | | | | | *.88* | -.42 | -.19 | -.15 | -.06 | -.29 | **.59** | -.43 |
| NFC1 | | | | | | *.89* | .36 | .20 | .20 | .62 | -.32 | **.71** |
| GRD2 | | | | | | | — | .52 | .49 | .36 | -.26 | .36 |
| ASC2 | | | | | | | | *.96* | .86 | .26 | -.15 | .26 |
| INT2 | | | | | | | | | *.94* | .24 | -.08 | .26 |
| HFS2 | | | | | | | | | | *.87* | -.28 | .66 |
| FOF2 | | | | | | | | | | | *.90* | -.39 |
| NFC2 | | | | | | | | | | | | *.89* |
| Mean | 3.12 | 2.52 | 2.48 | 2.92 | 1.86 | 4.46 | 3.15 | 2.44 | 2.37 | 2.72 | 1.71 | 4.69 |
| SD | 0.95 | 1.06 | 1.20 | 0.57 | 0.61 | 0.84 | 0.83 | 1.06 | 1.21 | 0.56 | 0.61 | 0.87 |
| Min | 1.00 | 1.00 | 1.00 | 1.14 | 1.00 | 2.19 | 1.25 | 1.00 | 1.00 | 1.00 | 1.00 | 2.50 |
| Max | 5.00 | 5.00 | 5.00 | 4.00 | 4.00 | 6.94 | 5.00 | 5.00 | 5.00 | 4.00 | 3.71 | 6.88 |
| Skew | 0.06 | 0.34 | 0.49 | -0.23 | 0.45 | 0.16 | 0.20 | 0.32 | 0.56 | -0.02 | 0.89 | 0.07 |
| Kurtosis | -0.59 | -0.65 | -0.75 | -0.07 | -0.34 | 0.14 | -0.53 | -0.63 | -0.74 | 0.17 | 0.47 | -0.45 |

*Note.* $N = 171\text{-}259$ due to missings; $p < .05$ for $|r_s| > .18$; coefficients in the diagonal are Cronbach's $\alpha$, bold-faced coefficients give the 53-59 week retest reliability; GRD = Grade Chemistry, ASC = Ability Self-Concept Chemistry, INT = Interest in Chemistry, HFS = Hope for Success, FOF = Fear of Failure, NFC = Need for Cognition at measurement occasion 1, and 2, respectively

[tbp]

Table 7

*Multiple regressions of subject grades at T2 on predictors at T1*

|  | B | SE | CI.LB | CI.UB | β | p |
|---|---|---|---|---|---|---|
| German |  |  |  |  |  |  |
| Intercept | 0.374 | 0.300 | -0.214 | 0.962 | .465 | .213 |
| Grade German | 0.506 | 0.063 | 0.382 | 0.629 | .499 | < .001 |
| Ability Self-Concept German | 0.289 | 0.072 | 0.147 | 0.430 | .294 | < .001 |
| Interest in German | -0.022 | 0.052 | -0.124 | 0.079 | -.027 | .668 |
| Hope for Success | -0.129 | 0.089 | -0.303 | 0.045 | -.091 | .145 |
| Fear of Failure | -0.044 | 0.061 | -0.165 | 0.076 | -.033 | .470 |
| Need for Cognition | 0.183 | 0.068 | 0.050 | 0.316 | .192 | .007 |
| Math |  |  |  |  |  |  |
| Intercept | 1.498 | 0.517 | 0.484 | 2.512 | 1.368 | .004 |
| Grade Math | 0.493 | 0.089 | 0.318 | 0.667 | .461 | < .001 |
| Ability Self-Concept Math | 0.057 | 0.122 | -0.182 | 0.295 | .052 | .643 |
| Interest in Math | 0.041 | 0.084 | -0.124 | 0.207 | .043 | .625 |
| Hope for Success | -0.083 | 0.140 | -0.357 | 0.191 | -.043 | .552 |
| Fear of Failure | -0.184 | 0.111 | -0.401 | 0.033 | -.102 | .097 |
| Need for Cognition | 0.091 | 0.107 | -0.118 | 0.300 | .070 | .392 |
| Physics |  |  |  |  |  |  |
| Intercept | -0.234 | 0.381 | -0.979 | 0.512 | -.252 | .539 |
| Grade Physics | 0.533 | 0.064 | 0.407 | 0.658 | .590 | < .001 |
| Ability Self-Concept Physics | 0.062 | 0.096 | -0.126 | 0.249 | .066 | .521 |
| Interest in Physics | -0.035 | 0.068 | -0.169 | 0.099 | -.044 | .610 |
| Hope for Success | 0.116 | 0.109 | -0.098 | 0.330 | .071 | .288 |
| Fear of Failure | 0.117 | 0.092 | -0.063 | 0.298 | .076 | .204 |
| Need for Cognition | 0.217 | 0.076 | 0.068 | 0.366 | .197 | .004 |
| Chemistry |  |  |  |  |  |  |
| Intercept | 0.583 | 0.348 | -0.098 | 1.265 | .703 | .093 |
| Grade Chemistry | 0.554 | 0.054 | 0.448 | 0.661 | .633 | < .001 |
| Ability Self-Concept Chemistry | 0.088 | 0.069 | -0.048 | 0.223 | .112 | .205 |
| Interest in Chemistry | -0.011 | 0.056 | -0.120 | 0.098 | -.016 | .839 |
| Hope for Success | -0.006 | 0.089 | -0.180 | 0.168 | -.004 | .943 |
| Fear of Failure | 0.051 | 0.082 | -0.111 | 0.213 | .037 | .536 |
| Need for Cognition | 0.122 | 0.062 | -0.001 | 0.244 | .124 | .051 |

*Note.* $N = 271\text{-}275$; coefficients are unstandardized slopes $B$ with their standard errors $SE$ and 95% confidence intervals ($CI.LB =$ lower bound, $CI.UB =$ upper bound), $\beta$ is the standardized slope and $p$ the respective $p$-values.