# The Relative Importance of Intelligence and Motivation as Predictors of School Achievement: A Meta-analysis

eTale 2022



This meta-analysis summarises 74 studies (N = 80,145) that simultaneously examined the predictive power of intelligence and motivation for school achievement. In a path model, 24% of variance in school achievement was explained overall, 66.6% was uniquely explained by intelligence, and 16.6% uniquely by motivation. Both intelligence and motivation contribute substantial and unique shares to the prediction of school achievement and an additional share of commonly explained variance.

#### Authors: Katharina Kriegbaum, Nicolas Becker & Birgit Spinath

Source: Kriegbaum, K., Becker, N. & Spinath, B. (2018). The relative importance of intelligence and motivation as predictors of school achievement: A meta-analysis. *Educational Research Review*, *25*, 120-148, https://doi.org/10.1016/j.edurev.2018.10.001

This meta-analysis summarises 74 studies (N = 80,145) that simultaneously examined the predictive power of intelligence and motivation for school achievement. The average correlations were moderate between intelligence (r = 0.44) and motivation (r = 0.27) with school achievement and between intelligence and motivation (r = 0.17). Correlation between motivation and school achievement was higher for expectancies than for values. In a path model, 24% of variance in school achievement was explained overall, 66.6% was uniquely explained by intelligence, and 16.6% uniquely by motivation. Both intelligence and motivation contribute substantial and unique shares to the prediction of school achievement and an additional share of commonly explained variance.

- School achievement is strongly influenced by individual student prerequisities, such as cognitive and motivational factors.
- The term school achievement summarises performance outcomes in all domains taught at school.
- School achievement functions as a selection criterion for subsequent education and jobs and is typically operationalised via school grades or standardised tests.
- Standardised test achievements are a purer measure of student achievement compared to grades. However, school grades can be perceived as a highly ecologically valid measure of school achievement because they are good predictors of future academic success and are used as allocation and selection criteria for higher education and jobs.
- Verbal and mixed intelligence tests are more strongly associated with school achievement than nonverbal intelligence.
- Intelligence is more strongly related to standardised test achievements than to school grades.
- Achievement motivation can be divided into expectancies (academic self-concept and self-efficacy), and values (intrinsic/extrinsic motivation, task values, achievement motive, achievement goals and interest).
- Intelligence and motivation have been shown to predict school achievement, with intelligence typically being the stronger predictor.

- Ability to understand complex ideas
- Ability to adapt effectively to the environment
- Ability to learn from experience
- Ability to engage in various forms of reasoning
- Ability to overcome obstacles through thought

## What is motivation?

## Expectancies

- Academic self-concept is an individual's perception of their competence in a specific domain.
- Self-efficacy is individual expectancy about future performance and is typically measured as a conviction about how well one will be able to solve a certain task in the future.

# Values

- The value attributed to a certain task comprises different components: intrinsic value (enjoyment of task or interest), importance values (importance of doing well on a certain task), utility value (usefulness of a certain task for one's future), and cost.
- Interest can be defined as a personality-specific trait (such as a relatively stable preference for a specific learning topic) and a situation-specific state related to attraction of a specific learning condition.
- Whereas intrinsic motivation is defined as engaging in something for its own sake and for enjoyment, extrinsic motivation is defined as doing something for its consequences.
- Achievement goals can be divided in four different types: mastery-approach goals focus on the positive development of one's own competence; mastery-avoidance goals tap the fear of losing competence; performance-

approach goals focus on demonstrating one's own competence and performing better than others; and performance-avoidance goals focus on hiding supposed incompetence and striving not to perform worse than others.

 Achievement motives include hope for success (a positive attitude towards performance), the belief that one can succeed, positive emotions in achievement situations, and fear of failure (such as a negative, fearful attitude towards performance and negative emotions in corresponding situations).



#### The study

The purpose of the present meta-analysis was to summarise findings from the literature to investigate the relative importance of motivation and intelligence in predicting school achievement. Another purpose was to identify relevant moderator variables, including the type of achievement measure, motivational construct, intelligence measure, subject domain, study design, grade level, school form, gender, country, and year of publication.

#### Data

Data for the meta-analysis consisted of 74 published or unpublished studies.



## Findings

- The correlations for the relationship between intelligence and school achievement were positive and significant in all the 74 primary studies.
- The correlations for the relation between motivation and school achievement and between intelligence and motivation were also significant and positive in all studies except two (one in each).
- The mean correlation in the meta-analysis corrected for sampling error between intelligence and school achievement was M(r) = 0.44, whereas the corrected average correlations between motivation and school achievement and between intelligence and motivation were M(r) = 0.28 and M(r) = 0.17, respectively.
- The correction for error of measurement resulted in a corrected average correlation of M(r) = 0.52 between intelligence and school achievement, M(r) = 0.33 between motivation and school achievement, and M(r) = 0.20 between intelligence and motivation.

#### Moderator results

- The type of achievement measure, grade, gender, country, school form, and year of publication were nonsignificant moderators.
- The average correlation for motivation and school achievement was significantly higher for expectancies (M(r) = 0.40) than for values (M(r) = 0.22); hence, the type of motivational construct was a significant moderator.
- The average correlation between motivation and school achievement was significantly higher for the languages domain (M(r) = 0.39) compared to mathematics (M(r) = 0.22) or science (M(r) = 0.23).
- The average correlation between motivation and school achievement was significantly higher for studies with a cross-sectional design (M(r) = 0.29) compared to

longitudinal design having a distance between the measurement occasions from 13 months onward (M(r) = 0.15).

- The average correlation between intelligence and motivation was higher in studies with a cross-sectional design (M(r) = 0.18) compared to studies with a longitudinal design having a distance between the measurement occasions from 13 months onward (M(r) = 0.05).
- In the meta-analytic regression, intelligence strongly predicted (beta = 0.41) and motivation moderately predicted (beta = 0.20) school achievement.
- Overall, 24% of the variance in school achievement was explained by intelligence and motivation.
- Overall, 66.6% of the explained variance in school achievement was uniquely explained by intelligence, whereas motivation uniquely accounted for 16.6%, and 16.6% was explained in common by intelligence and motivation.



## Implications

- A central finding of the meta-analysis is that intelligence and motivation are only weakly positively associated.
- Results indicate that intelligence is a strong predictor of school achievement.
- The average correlation between motivation and school achievement is moderate and positive.
- Expectancies such as academic self-concept and self-

efficacy are more accurate predictors of school achievement compared to values such as intrinsic motivation, interest, achievement motive, and achievement goals.

- Since motivation is easier to influence and foster through instructional characteristics, feedback, learning contexts and situational factors, teachers should be aware of their power to motivate students toward higher achievement.
- Students should develop positive expectancies for success in their future assignments and exams and a realistic (yet positive) self-concept regarding ability.
- Teachers should support their students in developing a realistic academic self-concept. For example, this can be achieved by varying the difficulty of tasks, setting short-term goals, and providing clear, specific, and informative feedback.