



Intelligence moderates how education mediates the effect of social background on own attained occupational position[☆]



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ABSTRACT

A positive cognitive ability $\times$ motivation interaction effect on performance has been suggested. In the area of working life, attained occupational position could be seen as a measure of performance and earlier studies have indicated that the commonly found association between social background and own attained occupational position might be mediated through attained level of education. In the present study, it is hypothesized that both social background and level of education might be indicative of educational/occupational motivation and, therefore, the importance of level of education as a mediator should increase with increasing intelligence. This hypothesis was confirmed in a cohort of Swedish men born in 1949–1951 ($N = 49,246$). This moderated mediation seems mainly to be due to a strengthening of the association between attained level of education and attained occupational position with increasing intelligence. The association between attained level of education and attained occupational position was found to be more linear among men with high intelligence scores and more exponential among men with low scores. It is discussed that this might be due to a low validity in the measurement of intelligence among men who receive a low intelligence score at conscription but who, nonetheless, go on and attain a high level of education.

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1. Introduction

It has been suggested that there should be a positive cognitive ability $\times$ motivation interaction effect when predicting performance (e.g., Vroom, 1964), which would mean, assuming that the main effects tend to be positive, that the effect of ability on performance is stronger at high compared with low levels of motivation, and that the effect of motivation on performance is

stronger at high compared with low levels of ability. This notion has received some empirical support. In a large sample from the National Longitudinal Survey of Youth (NLSY), Ganzach, Saporta, and Weber (2000) found that educational motivation interacted positively with intelligence, measured with the Armed Forces Qualifying Test (AFQT), in its effect on the odds for high school graduation. Similarly, Hirschfeld, Lawson, and Mossholder (2004) found that motivation interacted positively with Scholastic Aptitude Test (SAT) scores when predicting grade point averages (GPAs) in a sample of undergraduate students. However, this interaction was found only when motivation was assessed with a more specific measure of academic achievement motivation rather than a measure of general achievement motivation. Yeo and Neal (2004) found a significant three way interaction effect between cognitive ability, effort, and practice on performance in an air traffic control task. The positive effort $\times$ practice interaction effect was stronger for individuals with high cognitive ability than it

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was for those with lower scores. However, when using the personality characteristics need-for-achievement and dependability as conceptualizations of motivation, Sackett, Gruys, and Ellingson (1998) found no ability $\times$ motivation interaction effect on job performance in samples of army personnel, managerial employees, entry-level bakery employees, and employees in a financial institution.

According to Campbell (1990), individual difference in performance is a function of three, and only three, major determinants: (1) declarative knowledge, which is knowledge about facts and things, and an understanding of a given task's requirements; (2) procedural knowledge and skill, which include cognitive skill, psychomotor skill, and interpersonal skill; and (3) motivation, which is the combined effect of three choices: (a) the choice to expend effort; (b) the choice of the level of effort to expend, and (c) the choice to persist at that level of effort. This model has received empirical support, for example in a sample of 1580 soldiers with eight different military occupational specialties (McCloy, Campbell, & Cudeck, 1994).

In a related line of research, Schmidt and colleagues have looked at how subjects allocate time to competing tasks. They have, for example, found that people tend to allocate more time to a rewarded goal than to one that is not rewarded (Schmidt & DeShon, 2007). When people have two equally valued goals, they tend to allocate more time to the goal that is closest to attainment if both goals are judged as difficult to attain. If both goals are judged as easy to attain, on the other hand, more time is allocated to the goal that is furthest from attainment (Schmidt & Dolis, 2009). Schmidt, Dolis, and Tolli (2009) found that when goal progress was only due the performers' actions, they tended to allocate more time to the goal that was closest to attainment early on and to the goal furthest from attainment as the deadline neared. In a condition where goal progress was also influenced by unpredictable external factors, this time to deadline $\times$ distance from goal attainment interaction effect on time allocation was reversed. In this latter condition, it was also found that people with a strong mastery orientation tended to allocate more time to the goal furthest from attainment, while those with a strong avoidance orientation tended to allocate more time to the goal closest to attainment.

Attained occupational position could be seen as a measure of performance in the area of working life and intelligence or cognitive ability has been indicated as one of the best predictors of both attained occupational position (Ball, 1938; Deary et al., 2005; Herrnstein & Murray, 1994; McCall, 1977; Nettle, 2003; Strenze, 2007) and level of education (e.g., Sorjonen, Hemmingsson, Lundin, Falkstedt, & Melin, 2012; von Stumm, Macintyre, Batty, Clark, & Deary, 2010). Besides intelligence, a person's level of education probably also indicates to what extent he or she is motivated to perform in the area of working life, and level of education has often been found to have an even stronger unique effect on attained occupational, or a more general socioeconomic, position than intelligence (e.g., Johnson, Brett, & Deary, 2010; Schoon, 2008; Sorjonen et al., 2012).

Studies have also found that social background, operationalized for instance as the status of the father's occupational position, is associated with peoples' own attained occupational position (e.g., Breen & Goldthorpe, 1999, 2001),

even after adjusting for the positive association between a more professional background and higher intelligence (e.g., Deary et al., 2005; Sorjonen et al., 2012). Some suggest that this association between social background and attained occupational position is mediated through level of education (e.g., Blau & Duncan, 1967; Härkönen & Bihagen, 2011; Ishida, Müller, & Ridge, 1995; Warren, Hauser, & Sheridan, 2002). A positive association between a more professional background and a higher level of education has been shown, even after adjusting for intelligence (e.g., Schoon, 2008; Sorjonen et al., 2012). This could, for instance, be due to a higher educational motivation among those with a more professional background, which, in its turn, could be attributable to greater perceived expectations from parents and others and/or greater perceived chances to succeed.

If we assume that level of education mediates the association between social background and attained occupational position, the size of this mediated effect is the product of two effects: (1) of social background on level of education, and (2) of level of education on attained occupational position when adjusting for social background. However, if, as discussed above, both a more professional background and a high level of education are positively associated with a higher educational/occupational motivation, and if we assume that there is a positive ability $\times$ motivation interaction effect on performance, both of these effects should increase in strength with increasing intelligence. This would mean that the importance of education as a mediator of the association between social background and own attained occupational position should increase with increasing intelligence.

The assumption that both social background and attained educational level are indicative of educational/occupational motivation might be seen as problematic and more direct measures of motivation would, of course, have been preferable. However, this assumption concurs with Schoon (2008), who found positive associations between school motivation and a more professional background and attained level of education in two British cohorts. It could be argued that level of education should be indicative of at least one of Campbell's (1990) three motivation related choices described above, namely the choice to persist at a certain level of effort.

2. Method

2.1. Subjects

The present study was based on data from 49,246 Swedish males, born between 1949 and 1951. They were conscripted for compulsory military service in 1969/70. At that time, only 2–3% of all Swedish men were exempted from conscription, in most cases owing to severe handicaps or congenital disorders.

2.2. Assessment of intelligence

Four separate IQ tests were performed, mainly in order to assess the conscripts' suitability for education as officers. According to Ross (1988), the first and second tests measured logical inductive and verbal intelligence, whereas the third test measured spatial intelligence, and the last test measured technical understanding. The raw scores on all four tests

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