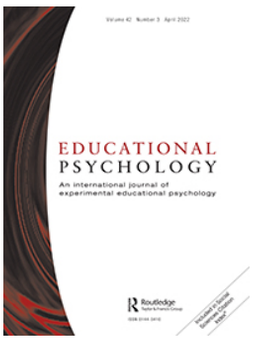

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Socio-economic status, gender and achievement: the mediating role of expectancy and subjective task value

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ABSTRACT

Expectancy-Value Theory predicts that expectancy of success and subjective task value (STV) underlie differences in motivation and achievement. This study investigated how gender and SES related to achievement mediated by expectancy of success, STV, and their interaction. The sample consisted of 396 participants in their final year of upper secondary education. Self-report measures were completed of expectancy, STV, gender and socio-economic indicators. These were linked to exit examination grades (A Levels). Only parental education was directly related to achievement however gender and SES were indirectly linked to student grades through expectancy, STV, and the expectancy-STV interaction. Males, students with a higher level of parental education, and students from households with a higher number of possessions, all performed better in their examination due to higher expectations; higher STV amplified these relations. Gender and SES differences in achievement can be partly explained by psychological factors, namely students' expectations of success and STV.

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Expectancy of success; subjective task value; academic achievement; gender; socio-economic status

Introduction

This study focuses on the academic motivation and achievement of students taking high-stakes upper-secondary school exit examinations (General Certificate of Education Advanced Level Examination: A Level) in England. It aimed to investigate how socio-economic status and gender related to achievement mediated by two key motivational variables, namely expectancy of success (henceforth referred to as expectancy for brevity), subjective task value (STV), and their interaction. The expectancy and STV interaction is theorised to positively interact in predicting educational and achievement outcomes (e.g. Eccles, 2007). Recently, empirical studies have begun investigating this possibility (e.g. Nagengast et al., 2011; Trautwein et al., 2012). Furthermore,

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Supplemental data for this article can be accessed here.

while gender and socio-economic differences in achievement are well-established (Eccles-Parsons et al., 1984; Simpkins et al., 2006; Sirin, 2005; White, 1982), how socio-economic differences in achievement may be explained by expectancy and STV has not been widely studied. In the present study, we address these limitations by examining how gender and socio-economic status (SES) are related to subsequent A Level achievement in a sample of final year upper-secondary students, mediated by expectancy and STV interactions.

Overview of Expectancy-Value Theory

Eccles' Expectancy-Value Theory (EVT) of achievement motivation (Eccles, 2007; Eccles et al., 1983; Wigfield & Eccles, 2000) suggests that an individual's expectations and STV directly influence achievement choices and performance. Expectations comprise of ability beliefs, defined as the perceptions of an individual's current competence at an activity, and the probability of success in the future (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). STV refers to the worth attributed to a task with regards to its attainment (AV), intrinsic (IV), and utility value (UV). That is, the value attributed to achievement, enjoyment and usefulness of a task, respectively (Eccles, 2007; Eccles et al., 1983; Eccles-Parsons et al., 1984; Eccles & Wigfield, 1995). These expectations and values have been measured extensively using the Self-and-Task Perception Questionnaire (STPQ: Eccles & Wigfield, 1995) which focuses on expectations, values, perceived difficulty and effort. EVT specifies those factors that impact expectations and STVs including socio-cultural (e.g. gender and socio-economic status, socialiser's beliefs and behaviours, stable child characteristics) and psychological factors (e.g. achievement-related experiences, perceptions of socialiser's beliefs, roles and task demands).

Although perceived cost was included in early STPQ measures (Eccles et al., 1983; Eccles-Parsons et al., 1984), it was later was removed (Eccles & Wigfield, 1995) and EVT studies remained focussed only on the expectancy and STV components (Wigfield & Eccles, 2000). The most recent version of the STPQ was used in the present study. In contrast to the other components of STV, cost was viewed as the negative aspects that result from engaging in a task (Eccles & Wigfield, 2002) and has been found to be distinct from STV. It remains unclear what cost dimensions are and whether these are best treated as distinct cost components or treated as indicators of a single omnibus cost (e.g. Flake et al., 2015; Jiang et al., 2020).

Until relatively recently expectancy and STV were examined in an additive, rather than interactive, fashion, despite the theoretical prediction that high STV would amplify relations from expectancy and achievement (Nagengast et al., 2011). That is, the magnitude of the positive relation between expectancy and achievement is stronger at higher levels of STV and weaker at lower levels of STV. Pictured graphically, achievement would be low when expectancy was low irrespective of STV. At greater levels of expectancy, however, the moderating role of STV becomes evident in an increasing discrepancy between the achievement of students with high and low STV. When expectancy was high, achievement would be higher when STV was also high compared to those for whom STV was low. In short, the highest achievement is found when both expectancy and STV are high.

Recent studies have taken advantage of more powerful software packages to empirically test the expectancy × STV interaction in conjunction with latent variable modelling approaches that control for measurement error. For example, Nagengast et al. (2013), using a within person perspective, found associations between domain specific expectations and values on homework engagement across six different subjects in secondary school students using the 2006 PISA dataset. Trautwein et al. (2012) showed that STV amplified positive relations between expectancy and achievement in mathematics and English, again in a sample of secondary school students. Similar results have been shown for the selection of higher mathematics courses (Guo, Parker, et al., 2015).

Furthermore, Guo, Marsh, et al. (2015) found, somewhat contrary to EVT, high UV to protect mathematics achievement and career aspirations from low expectancy. That is, the greatest disparity in achievement/career aspirations between high and low UV was found when expectancy was low rather than, as anticipated, it was high. The present study contributes to this body of work by using a latent variable modelling approach to examine expectancy × STV interactions in a sample of English secondary students in their final year of upper secondary education taking A Level examinations.[1] This has been a hitherto neglected sample in researching achievement motivation and studies examining the expectations and STV patterns across school subjects, rather than domain specific ones, are rare (Chow & Salmela-Aro, 2011), highlighting the additional importance of this work. While domain specificity has been found to be important in previous studies, students do not study high-stakes subjects in isolation; rather the grades achieved across domains are used to determine their future life pathways, and therefore understanding how expectations and STV patterns apply when studied across subject domains are important. Indeed recent research has shown that students have similar (global) expectations and STVs across most learning situations (Dietrich et al., 2019).

Gender and socio-economic differences in expectations, STV and achievement

Gender differences

In England, where the present study was located, recent data showed a higher average A Level grade was achieved by female students whereas a higher proportion of male students achieved top grades (Department for Education, 2019). These data accord with the general finding that girls are found to outperform boys on indicators of educational success (Kessels et al., 2014) possibly because of the perceived fit between gender identity and gendered social meanings which determine academic engagement (Kessels et al., 2014). In a large meta-analysis higher achievement on teacher assessed work was found in girls (in a sample ranging from elementary through to university level) in all subject domains (Voyer & Voyer, 2014). There was a greatest advantage for language courses and smallest for maths and the overall differences were stable and not affected by year of publication (1914–2012). This is an interesting contrast to earlier studies, including meta-analyses which indicated an achievement differences favouring males in STEM subjects and females in reading comprehension (e.g. Hyde et al., 2008). This finding is mirrored in data using standardised tests such as PISA or PIRLS where girls have been found

to outperform boys in literacy subjects and underperform in mathematical subjects (e.g. OECD, 2013), are less confident in these areas (Kessels & Hannover, 2008) and have less interest (Eccles, 2011). Overall there is, therefore, a variable pattern in research findings concerning gender and achievement.

Gender is known to influence achievement through expectations and STV (Eccles, 2007). Females have shown lower achievement in mathematics and science subjects due to lower STV, and they also hold lower expectations about achievement (Eccles-Parsons et al., 1984; Guo, Parker, et al., 2015). Whilst males achieved better in Science, Technology, Engineering and Mathematics (STEM) subjects they had lower expectancy and STV in verbal subjects (e.g. English), consistent with reports of higher expectations and STV for females in such domains (e.g. Gaspard et al, 2019; Nagy et al., 2008). More recent studies, however, have shown different results. Guo, Marsh, et al. (2015) found that male achievement was explained by their higher self-concept but when there were similar levels of self-concept and IV girls' achievement was higher. Overall there was no gender difference in achievement. Recently it was also found that whilst boys had advantages in STEM subjects and lower expectancy for success and task value in verbal domains there were only small overall gender differences in achievement (Parker et al., 2020). There is, seemingly, an emerging variation in findings cross-culturally and across different subject domains (e.g. Watt et al., 2012) with regards to gender. As such Guo, Marsh, et al. (2015) claimed that a lack of conclusive empirical evidence prevents the possibility of making definitive predictions about gender differences in the associations between motivational beliefs and educational attainment. In the present study, we adopted the standpoint of Guo, Marsh, et al. (2015); the direction of differences in motivational patterns across A Level subjects will be treated as exploratory due to the overall inconsistency of findings across the literature. Nonetheless, the relations between gender and achievement are expected to be mediated by expectancy, STV, and their interaction.

Socio-economic differences

It is widely documented that students from lower socioeconomic backgrounds perform more poorly than their peers from more affluent families across many countries and age groups (Sirin, 2005; White, 1982). SES has both a direct effect on achievement through home resources (e.g. books, desk) and social capital, namely social connections that reflect shared norms, values and understandings (Bradley & Corwyn, 2002; Coleman, 1988) and indirectly through parental education, expectations, and aspirations (e.g. Eccles, 1992). Parent socialisation models, therefore, propose that family demographic and SES variables indirectly relate to achievement outcomes through expectations and STV; an assumption underlying EVT (Eccles & Davis-Kean, 2005).

Recently Guo, Marsh, et al. (2015) found that SES positively predicted achievement, directly and indirectly, by promoting academic self-concept and STV, with those from higher SES groups achieving more highly on the Trends in International Mathematics and Science Study (TIMMS) mathematics tests and showing higher motivation. The indirect path from SES to achievement was statistically significant and mediated by higher academic self-concept and UV. Kreigbaum and Spinath (2016) obtained a small to moderate correlation between parents' SES and children's achievement in

mathematics (higher SES associated with higher achievement). They also examined the mediating role motivational constructs play in the relationship between parental SES and children's mathematical achievement in standardised tests. They found that competence beliefs (self-concept in mathematics, task specific self-efficacy for mathematics and global self-efficacy; all of which are constructs related to expectancy) mediated the relationship between SES and achievement. Children of parents with a higher SES had a more positive academic self-concept, greater self-efficacy and a greater interest in maths, which resulted in higher achievement. Based on this premise, and the known relationships between higher SES and achievement, it is anticipated that, in the current research, students who report higher SES will have higher expectations and STV and, in turn, show higher achievement.

Aims of the present study

As indicated, there are few studies that investigate the complex relationships between gender, SES, expectations, STV, and achievement in a single model. The present study seeks to contribute to this gap by exploring how SES and gender relate to A Level achievement mediated by expectations, STV, and an expectation $\times$ STV interaction. A key aim of this study is to explore how these factors explain the complex picture of A Level achievement with the purpose of extending previous empirical work. Notably, studies examining how expectancy and STV mediate relations between socio-cultural variables (such as gender and SES) have yet to incorporate the analytic advances shown in recent studies (e.g. Nagengast et al., 2011; Trautwein et al., 2012) to address the expectation $\times$ STV interaction. The present study offers a novel empirical contribution by addressing this limitation. As we can make a theoretically grounded prediction for the direction of relations for SES, expectancy, STV, and achievement, we offer the hypotheses that follow. Given the difficulty in making definitive predictions regarding gender, expectancy, STV and achievement, we do not offer any firm hypotheses for this variable. We do, however, expect any gender differences in achievement to be mediated by expectancy and STV, but leave the direction of gender differences as an open-ended research question.

H1: Students with higher SES will report higher expectations and values.

H2: Expectation and STV, and their interaction, will be positively related to achievement.

H3: Relations between SES and achievement will be mediated by expectations, STV, and their interaction.

Method

Participants

The sample consisted of 396 students in their final year (Year 13) of upper secondary schooling in England[2] aged 17–18 years. There were 193 female and 203 male students drawn from 11 schools. There was a larger proportion of participants from independent schools (38.1%) than was typical for England (18%) in the year that data were collected (Department for Education, 2014a). The sample in this study was

predominantly White ($n = 336$, 80.6%) with smaller numbers from Black ($n = 3$, 0.8%), Asian ($n = 33$, 8.4%), and mixed heritage backgrounds ($n = 21$, 5.1%). Three students did not report their ethnic heritage. The proportion of participants from White backgrounds was broadly representative of other English schools (79.8%; Department for Education, 2014a). A small number of students ($n = 16$, 4.0%) were eligible for free school meals; a proxy for low income. This was approximately in line with figures for England (4.9%, Department for Education, 2017). The proportion of missing data was low (0.93%) and handled in subsequent analyses using Full Information Maximum Likelihood.

The use of a composite measure for expectations and STV has been used across a number of studies (e.g. Dietrich et al., 2019; Kosovich et al., 2015; Part et al., 2020). These authors argue for a common rationale; that there is a substantial literature that supports the idea that IV, AV, and UV, are highly correlated, load onto one factor (e.g. Eccles et al., 1993; Perez et al., 2014), and can therefore be combined into a single scale. Part et al. (2020) showed that STV can be seen as a set of global beliefs; that is, a global STV that can co-exist alongside specific STV. Furthermore, recent research proposes that students experience most learning situations in terms of similar expectancies and STVs (Dietrich et al., 2019). The rationale and findings of such previous research indicates there are important advantages for the use of a combined scale in this study. Dietrich et al. (2019) argue that a composite measure offers a rapid, practical means to measure student motivation.

Measures

Expectations and STV

A 12 item expectancy-value questionnaire was used to investigate students' expectations and values about A Level achievement, adapted from the STPQ (Eccles & Wigfield, 1995). Students were informed that the questionnaire would ask them about their family background, and their beliefs, values and expectations about their A-levels. A 7-point Likert scale was employed (example, e.g. 1 = very poorly/not at all important, 4 = neither, 7 = very well/very important). There were five expectancy items focussed on A-level performance and outcomes including ability perceptions and expectations for success (e.g. 'How well do you think you will do in your A-levels this year?'). The STV attributed to these qualifications was assessed using seven further items focussed on the perceived intrinsic, attainment and utility value of A Levels (e.g. 'How important is it to you to get good grades in your A-levels?').

The original subscales for expectancy and STV all showed good internal reliability on the self-and-task perception questionnaire (Eccles & Wigfield, 1995) with the exception of UV which was low ($\alpha = .62$). Items measuring expectations showed good reliability ($\alpha = .92$) and those assessing intrinsic value ($\alpha = .76$) and attainment value ($\alpha = .70$) were acceptable. The construct validity of the STPQ was reported to be good (Eccles & Wigfield, 1995). Preliminary analyses reported in Supplementary Materials showed that STV items were better represented as a unidimensional factor, rather than as a three-factor or higher-order model. The reliability and construct validity of the scales used in the present study were good (see Table 1).

Academic achievement

Achievement data was calculated by using the average A Level point score per student achieved in that academic year based on the points allocated in the calculations used by the DfE (Department for Education, 2014b). Thus for a full A-level qualification taken in year 13 an A* was awarded 300 points, an A grade 270, a B grade 240, a C grade 210, a D grade 180 and an E grade 150 points. It did not include any grades already attained in the previous academic year (Year 12).

Socio-economic status

In the present study analyses of SES variables focussed on level of parental education and number of home possessions. These are measures typically included when examining SES (e.g. Caro & Cortés, 2012). Items were derived from the Programme for International Student Assessment (PISA) student and parental questionnaires (2009, 2012). To indicate the level of parental education students were asked to report their mother and father's highest level of education.

Home possessions were calculated as a summed score of possessions based on the list of 13 items used in the PISA questionnaires, including, for example, whether the student had a room of their own, a computer for school work, classic literature, works of art and a musical instrument. A score of 1 was given for each item a student reported possessing that was summed to provide a total score for home possessions. Whilst many studies use free school meals as a proxy for low SES the current study instead had the advantage of measuring it more directly and accurately using parental education and specific home possessions based on the International PISA items.

Procedure

All Further Education colleges,[3] independent and state schools in Oxfordshire received an email inviting them to participate in the study with a 1-month cut-off date for response. Consenting students in the volunteering institutions then completed the paper and pencil questionnaires prior to the summer examination series in May 2014. The study complied with the British Psychological Society's Code of Human Research Ethics (British Psychological Society, 2014) and received ethical clearance from the University ethics committee. Questionnaires took approximately 20 minutes to complete. Following the national release of the examination results in August that year each school provided the achievement data (A Level grades) of the participating students. Achievement data was then calculated by using the average point score per student achieved in that academic year based on the points allocated in the calculations used by the DfE (Department for Education, 2014b) as discussed above.

Overall 50 A-level subjects were studied by the 396 students, totalling 1033 examination entries with an average point score of 219 points. This figure was in line with the average point score per A Level equivalent (215.5) for students aged 16–18 at the end of advanced level study in the year the results for the current study were collected (Department for Education, 2015).

Results

Descriptive statistics and bivariate correlations

Descriptive statistics are reported in Table 1. Data were normally distributed (skewness and kurtosis within ±1) with the exception of examination performance that showed a slight negative skew. Internal consistency of the two latent constructs (expectancy and STV) were good (Cronbach's $\alpha \geq .84$) and standardised factor loadings, taken from the measurement model described below, were strong ($\lambda \geq .72$). The proportion of variance attributable to the school level was moderate to large for the level of parental education, number of household possessions, and examination performance ($\rho_I \geq .19$). Accordingly, subsequent latent modelling in M*plus* used the type = 'complex' command to adjust standard errors for the clustering of data within schools.

A measurement model of expectancy and STV was examined using confirmatory factor analysis in M*plus* v.8 (Muthén & Muthén, 2017) using the maximum likelihood indicator. Expectancy contained five indicators and STV seven. Residual variance in the two IV indicators, three AV indicators, and two UV items, was allowed to vary. This, and all subsequent models, was evaluated using the following fit indices: Root mean square error of approximation (RMSEA), standardised root means square residual (SRMR), comparative fit index (CFI), and the Tucker-Lewis index (TLI). A good fit to the data is indicated bv RMSEA ≈ .08, SRMR ≈ .06 and CFI/TLI values ≈ .95 (Hu & Bentler, 1999). It should be noted, however, that these values, derived from simulation studies, may be somewhat strict when applied to the evaluation of real-life data in complex models (e.g. Heene et al., 2011).

This measurement model showed a good fit to the data, $\chi^2(39) = 141.94$, $p < .001$, RMSEA = .063, SRMR = .033, CFI = .978, and TLI = .959, (the range of standardised factor loadings is reported in Table 1). To estimate latent bivariate correlations gender (0 = female, 1 = male), level of parental education, number of household possessions, and examination performance were added to the measurement model as single-indicator latent variables. This model also showed a reasonable fit to the data, $\chi^2(75) = 221.16$, $p < .001$, RMSEA = .070, SRMR = .059, CFI = .949, ad TLI = .928, and so we proceeded to examine correlations coefficients (reported in Table 2). Expectancy showed positive correlations with STV, level of parental education, number of household possessions, and examination performance. STV showed positive correlations with level of parental education and examination performance. Expectancy was higher in male students and STV higher in female students.

Table 1. Descriptive statistics for expectancy of success, subjective task value, level of parental education, number of household possessions, and examination performance.

	Range	Mean	SD	α	ρ_I	Skewness	Kurtosis	λ
Expectancy of success	5–35	21.35	5.28	.90	.05	−0.34	0.20	.74–.85
Subjective task value	7–49	36.45	6.81	.84	<.01	−0.35	−0.27	.45–.85
Level of parental education	2–5	4.36	0.73	—	.42	−0.85	−0.42	—
Number of possessions	4–13	11.07	1.90	—	.19	−0.84	0.07	—
Examination performance	0–270	198.27	59.11	—	.28	−1.05	0.79	—

Table 2. Bivariate correlations between expectancy of success, subjective task value, gender, level of parental education, number of household possessions, and examination performance.

	1.	2.	3.	4.	5.	6.
1. Expectancy of success	—	.43***	.13*	.29***	.23***	.58***
2. Subjective task value		—	−.17**	.20**	.12	.38***
3. Gender			—	.05	.10	−.01
4. Level of parental education				—	.45***	.52***
5. Number of household possessions					—	.29***
6. Examination performance						—

*$p < .05$. **$p < .01$. ***$p < .001$.

Structural equation modelling

A structural equation model was used to test the moderated meditational model proposed in Figure 1. Direct paths were estimated from gender, level of parental education, and number of household possessions, to examination performance, as well as indirect paths mediated by expectancy, STV, and their interaction, using 1000 bootstrapped draws. The interaction between expectancy and STV was modelled using the unconstrained approach (Marsh et al., 2004, 2006). In this approach, mean-centred indicators of first-order effects (i.e. expectancy and STV) are multiplied in order to create indicators for a latent interaction term. Although a greater number of interaction terms can reduce bias (Yang, 1998) it can also result in non-convergence and problems with model estimation (Ping, 1998). Accordingly, we used four indicators as the optimal number (see Marsh et al., 2004). The unconstrained approach to modelling latent interactions performs as well as the constrained and residual-centred approaches (Marsh et al., 2004; Steinmetz et al., 2011) and advantageously, allows for the estimation model fit indices.

The four new multiplicative latent interaction indicators were created by randomly pairing mean-centred expectancy indicators with mean-centred STV indicators. As there were five indicators for expectancy, two randomly chosen items were parcelled; as there were seven indicators for STV, three pairs of randomly chosen items were parcelled). To allow for model estimation the means of expectancy and STV were fixed to zero, and the mean of the latent interaction variables was fixed to equal the covariance of the control and value variables (see Marsh et al., 2004, 2006). The SEM showed a reasonable fit to the data: $\chi^2(114) = 269.61$, $p < .001$, RMSEA = .059, SRMR = .056, CFI = .945, and TLI = .927, and so we proceeded to examine path coefficients (see Figure 2).

Paths from gender, level of parental education, and number of household possessions, to expectancy and STV

Expectancy was predicted by gender ($\beta = .11$, $p = .03$), level of parental education ($\beta = .23$, $p < .001$), and number of household possessions ($\beta = .12$, $p = .001$). STV was predicted by gender ($\beta = -.18$, $p = .002$) and level of parental education ($\beta = .19$, $p = .08$), but not the number of household possessions ($\beta = .05$, $p = .50$).

Paths from gender, level of parental education, and number of household possessions, to examination performance

Examination performance was directly predicted by the level of parental education ($\beta = .37$, $p < .001$). There was no direct relation between examination performance and

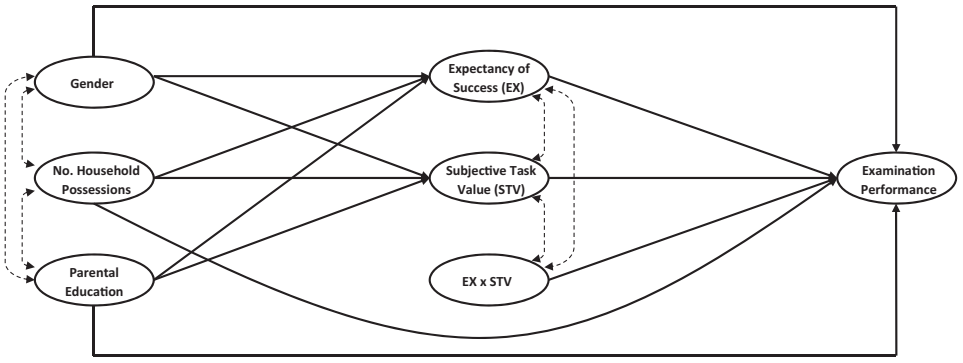

Figure 1. A moderated mediational model to show direct and indirect (mediated by expectancy of success, subjective task value, and their interaction) paths from gender, level of parental education, and number of household possessions, to examination performance.

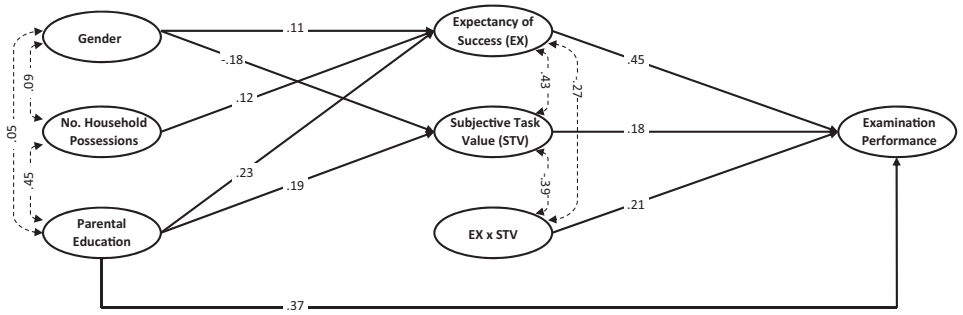

Figure 2. A structural equation model to show statistically significant direct and indirect (mediated by expectancy of success, subjective task value, and their interaction) paths from gender, level of parental education, and number of household possessions, to examination performance (dashed lines represent correlations).

gender ($\beta = -.08$, $p = .35$) or between examination performance and number of household possessions ($\beta = -.01$, $p = .84$).

Paths from expectancy, STV, and their interaction, to examination performance

Examination performance was predicted by expectancy ($\beta = .45$, $p < .001$), STV ($\beta = .18$, $p = .01$), and their interaction ($\beta = .21$, $p = .005$). The interaction between expectancy, STV was probed by estimating simple slopes between expectancy and examination performance at ±1SD STV. At mean STV a positive relation was shown between expectancy and examination performance ($B = .56$, $p < .001$). This relation was stronger at high (+1SD) STV ($B = .84$, $p < .001$) and weaker at low (−1SD) STV ($B = .29$, $p = .006$). Simple slopes are graphed in Figure 3.

The model-implied interaction between expectancy of success and subjective task value on examination performance

Indirect relations from gender, level of parental education, and number of household possessions, to achievement, mediated by expectancy, STV, and their interaction, were estimated by creating 95% confidence intervals around the unstandardised path

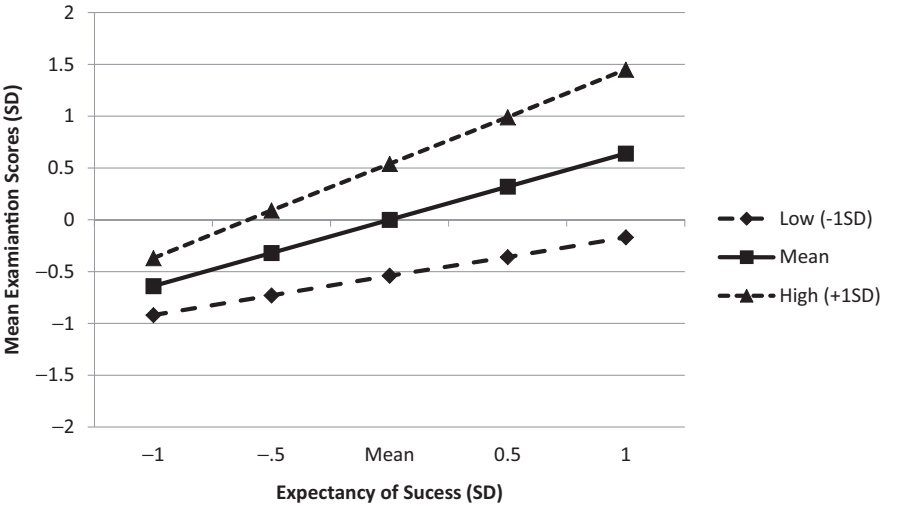

Figure 3. Indirect relations from gender, level of parental education, and number of household possessions, to examination performance mediated by expectancy, stv, and their interaction.

coefficients. Coefficients that do not cross zero are statistically significant at $p < .05$ (MacKinnon et al., 2004). Indirect relations with examination performance, mediated by expectancy, were shown for gender, $\beta = .05$, $SE = .02$, 95% CI [.01, .10], level of parental education, $\beta = .11$, $SE = .03$, 95% CI [.06, .15], and number of household possessions, $\beta = .06$, $SE = .01$, 95% CI [.04, .07]. Indirect relations mediated by STV were all non-statistically significant ($ps > .05$). Conditional indirect effects from gender, level of parental education, and number of household possessions, to examination performance, mediated by expectancy, were estimated at ±1SD STV. Unstandardised coefficients, and confidence intervals for the indirect effects, are reported in Table 3. Male students, students with a higher level of parental education, and students from households with a higher number of possessions, all performed better in their examination due to higher expectancy; STV amplified these relations.

Table 3. Unstandardised coefficients and confidence internals for conditional indirect effects.

	Level of subjective task value		
Predictor	−1SD [95% CIs]	Mean [95% CIs]	+1SD [95% CIs]
Gender	.07 [.01, .15]	.15* [.03, .26]	.22** [.05, .42]
Level of parental education	.12* [.03, 20]	.23** [.12, .35]	.35** [.18, .52]
Number of household possessions	.04* [.01, .06]	.07*** [.04, .10]	.11*** [.06, .15]

*$p < .05$. **$p < .01$. ***$p < .001$.

Discussion

The aim of the present study was to investigate how gender and SES related to A Level achievement mediated by expectancies, STV, and their interaction. It was found that parental education was directly related to achievement whilst gender and SES were indirectly linked to student grades through expectancy, STV, and the expectancy-STV interaction. Males, students with a higher level of parental education, and students from households with a higher number of possessions, all performed better in

their examination due to higher expectations; higher STV amplified these relations. Gender and SES differences in achievement can be partly explained by psychological factors, namely students' expectations of success and STV. Overall the hypotheses in this research were largely supported.

Firstly, it was predicted that students with higher SES would report higher expectancy and STV. Results showed that higher expectations and STV were predicted by a higher level of parental education, but a higher number of household possessions related only to greater expectancy. Hypothesis 1 was therefore only partially supported. Achievement was also positively predicted by parental education. The findings are consistent with the well-established literature showing a direct link between SES and achievement worldwide (Sirin, 2005; White, 1982). A direct relation between home resources and achievement was anticipated but not shown in the present study. Relations between SES and expectations may be explained by family socialisation models (Eccles & Davis-Kean, 2005) which accounts for the impact of socio-cultural factors, such as SES, on motivational variables. So, parents with high levels of education and high SES communicate higher expectancies, act as role models for educational trajectories and career aspirations and provide necessary educational resources and better educational experiences. In family socialisation models, expectancy and STV are determined partly by students' perceptions of socialisers' expectations which may lead to role modelling, communication of expectancies, and provision of differential experiences. These findings contribute to the literature by indicating which specific aspects of SES (parental education or home possessions) are linked to motivational variables (expectations and STV) and achievement in A Level students and suggesting that parents have a key role to play in motivation and educational outcomes by role-modelling and provision of resources.

Hypothesis 2 predicted that expectancy and STV, and their interaction, will be positively related to achievement. Achievement was predicted by expectations, STV and their interaction, over and above the variance accounted for by gender and measures of SES. Indirect relations with achievement, mediated by expectancy of success, were shown for gender, parental education, and number of household possessions. The hypothesis was therefore supported. Achievement in A Level, high stakes assessment, was an important determinant of motivational variables. The findings from the present study add to the recent research exploring these interactions in secondary school students (e.g. Guo, Marsh, et al., 2015; Guo, Parker, et al., 2015; Trautwein et al., 2012). The present study contributes to the field by investigating the interactions in an important, but otherwise neglected, sample of students to date as well as contributing to the small body of studies examining expectancy-value interactions using naturalistic data.

Hypothesis 3 was that relations between SES and achievement will be mediated by expectations, STV, and their interaction. Males, students with a higher level of parental education, and students from households with a higher number of possessions all achieved more highly due to higher expectancy. Higher STV, furthermore, amplified these relations. Therefore the anticipation that positive relations with SES would be mediated by expectations, STV, and their interaction, was substantiated. These findings are strongly in line with EVT and importantly, unlike previous studies (e.g. Guo et al., 2015), the results from the current research aligned with EVT. In contrast Guo et al. (2015) had found UV to protect mathematics achievement and career aspirations from

low (rather than high) expectancy. Expectations and values, and their interaction, predict achievement and are affected by socio-cultural variables such as SES and gender (Eccles, 2007; Guo, Marsh, et al., 2015). The relationships can be accounted for by underlying family socialisation models (Eccles & Davis-Kean, 2005). So A Level students will have been exposed to socio-cultural expectations and values associated with their gender and family SES and this will have led to differential experiences, role-modelling and perceptions regarding aspirations and educational outcomes. Our findings therefore contribute to the literature by expanding on previous research focussed on relations between background variables and educational outcomes and examining these associations in high-stakes assessments. It makes a theoretical contribution by further explaining the precise mechanisms that link SES and gender to achievement in high stakes exit examinations.

The findings are similar to those of Guo, Marsh, et al. (2015), where SES was found to positively predict behaviour directly, and indirectly via expectations and STV. In the present study, however, it was only the number of household possessions that related to expectations and not STV. Further exploration of the relationships between SES variables (possessions, parental income, and education), expectancy and STV may be useful in a wider and larger sample to give a better understanding of which aspects of SES are particularly important in the motivation and achievement. For example, whether composite measures of SES show stronger relations with grades and motivation variables or if specific aspects of SES (possessions, parental education or even parental occupation and income) interact differently with expectations, STV or achievement itself. There remains a gap in the research in this regard and the results of this study suggest it warrants further investigation.

There was no direct relationship between achievement and gender in this study, although males had higher expectations and STV. Indirect relations with achievement, mediated by expectations, were shown for gender, Male students performed better due to higher expectations; STV exemplified these relations. The direction of differences had been left deliberately open in line with recent approaches (Guo, Marsh, et al., 2015). Evidence has been mixed with regards to the gender differences in motivational variables across subjects (Watt et al., 2012). Reflecting the general pattern found across A Levels here males were previously found to have higher expectations and STV in maths and science domains particularly (Eccles-Parsons et al., 1984; Simpkins et al., 2006), unlike females where this was found in verbal domains (Gaspard et al., 2019; Nagy et al., 2008). The findings in this study are consistent with those of Guo, Marsh, et al. (2015) who found no gender differences in achievement overall. The lack of differences in achievement may be a reflection of the current narrowing of educational gaps in A Level as reflected in recent statistics – for example the national data for A Level by gender shows a gap of 1.63 in average point scores in 2017, 1.40 in 2018 and 1.24 in 2019 (Department for Education, 2021). The non-significant differences may also have been captured because of the benefits of studying the interactions across domains in contrast to studies that have looked at subject differences in gender differences which then only capture well known differences in achievement gaps in individual subjects (for example males showing higher achievement in STEM subjects for example).

Limitations and suggestions for further research

When interpreting the findings of the study the limitations should be considered. Firstly, any comparison to earlier studies should note that most of these tested domain specific expectations and STV whereas the data collected in this study generalised students' perceptions across subject domains. Given the emphasis on the importance of domain specificity the replication of established findings is perhaps therefore especially interesting to note because studies across subjects are rare. Investigation of student motivation across subjects reflects the context in which they study in high school and therefore adds ecological validity to the work because they do not study each subject in isolation but as a set of subjects across these high-stakes assessment. These assessments, as a whole, then determine life pathways and thus potentially reflect a global pattern of expectations and values across a learning context in line with recent literature (Dietrich et al., 2019). A composite measure of expectations and STV was used rather than separate measures which may have the disadvantage of failing to capture the specific interactions between A-levels and each component of STV (AV, IV, UV) however the known correlation between these variables as outlined in the introduction negates this. Any associations between SES, expectations, values and achievement should only be applied with caution to the wider population since higher SES groups were over represented in this sample, and indeed that is the case within the geographical area from which the sample was drawn. Issues of generalisability are known to be problematic when convenience samples are used despite its prevalence in social sciences (Bryman, 2012). It is acknowledged that these issues around the conceptualisation of STV and generalisability of a convenience sample do limit the applicability of the replications in this study. It is apparent that further research into the educational outcomes of A Level students on the basis of SES is warranted with a more extensive large-scale sample of students; allowing for a more varied, representative population in order to ensure greater validity and generalisability of research findings in this area. Expectancy-value models look at motivation within a socio-psychological framework and the confines of this study mean that it has not been possible to account for all of the contextual factors that may have influenced A Level achievement; the influence of parental occupation or school or teacher variables. It is acknowledged these may play a role beyond that investigated here and may account for variance in subsequent A Level achievement.

It is also possible that earlier educational achievement was an explanatory factor for the relationships which had not been accounted for in the present work. Given known reciprocal effects between achievement and educational attainment (Marsh & Craven, 2006), and the significance of prior achievement for post-16 choices and outcomes (Sammons et al., 2015), future research should include such data of previous educational attainment in significant examinations where possible.

Educational implications

It is clear that understanding the motivational factors underlying the differential achievement of A Level students is important. It has the potential to address issues surrounding attainment gaps in this student population and has clear relevance for policy makers, researchers, and educators looking for ways to increase student

performance in school, and to better prepare them for future education and entry into an increasingly global workforce (Silva & White, 2013). In the last decade, there has been an emerging field of research on interventions designed to enhance students' values and subsequent achievement which are useful to consider in the context of debates surrounding educational achievement in high stakes qualifications. By targeting psychological mechanisms, it is argued that educational outcomes can be enhanced in an efficient and cost-effective manner and these motivation interventions are reported to be extremely effective (Yeager & Walton, 2011). These include expectancy interventions and value interventions (Hulleman et al., 2016). They promote connections between the learning material and students' personal goals relevant to different life domains, such as future careers or daily life (Gaspard et al., 2015). As highlighted by Hulleman and Harackiewicz (2020) studies broadly show that interventions are most effective for students at risk of adverse learning outcomes, including those with histories of lower achievement (e.g. Hulleman et al., 2017), lower success expectancies (e.g. Hulleman & Harackiewicz, 2009), or from traditionally underrepresented groups in higher education such as underrepresented minorities or first generation students (e.g. Harackiewicz et al., 2016). The results of this study suggest that students studying for high-stakes qualifications may benefit from such interventions and these can also be targeted at specific groups (for example on the basis of socio-economic status or gender) although it has to be acknowledged that interventions may not work for all students in all situations (Durik et al., 2015; Hulleman et al., 2016). Studies show that interventions designed to raise aspirations, including those that offer students new opportunities, develop self-esteem, motivation or self-efficacy, are unlikely to be effective in narrowing actual attainment gaps (Education Endowment Foundation, 2018; Gorard et al., 2012). Overall however the findings from this research might suggest that nothing is to be lost and there may be potential gains from the implementation of interventions given the importance of high-stakes examinations for future life pathways.

Conclusion

The predictions in this study were supported. Overall students with higher SES reported higher expectations and STV. Expectations, STV and their interaction were positively related to achievement. Relations with SES were mediated by expectations, STV and their interactions. Males, students with a higher level of parental education, and students from households with a higher number of possessions, all performed better in their examination due to higher expectancy of success; higher STV amplified these relations. These findings have implications for addressing attainment gaps and introducing interventions to raise motivation for students studying for high-stakes examinations which are important trajectories for future life pathways.

Notes

1. In Years 12 and 13 students may choose academic, vocational, or technical, forms of upper secondary education. Students in the present study were in colleges specialising in academic upper secondary education (colloquially referred to as 6th form). University entrance is dependent on results of A Level exams.

2. In England, Years 12 and 13 are colloquially referred to as 6th form; a tier of academic upper secondary academic education.
3. Further Education Colleges in England are institutions that focus on academic, vocational, and technical upper secondary (aged 16–19 years) and adult education (aged 19 years upwards).

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No potential conflict of interest was reported by the authors.

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