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Using draw a person tasks to measure children's Assigned gender Ability Beliefs

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ABSTRACT

The UK-based article develops a quantitative method for measuring 8–9-year-old children's Gender Ability Beliefs through drawings, assessing the reliability and validity of the measure and its association with respondents' self-reported gender. The measure, originally used in the US by Beilock et al. (2010), required respondents to draw two pictures: one of someone good at mathematics and another good at reading. They also had to show whether each drawing was of a male or female by ticking a provided box. Findings indicate children are more likely to draw someone of the same assigned gender as their own for both skillsets. Male respondents were found to be more likely to indicate more traditional views in males being good at mathematics and females good at reading. The article concludes that drawings can be used as quantitative self-completion methods with child respondents, whilst presenting evidence to consider how we do so with concepts like gender that require validity and can be used internationally.

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Introduction

The article presents a quantitative approach to measuring children's Gender Ability Beliefs through self-completed surveys, presenting evidence of validity through missing data analysis and substantive data supporting findings from previous studies. Gender Ability Beliefs are an attitudinal measure originally designed by Beilock et al. (2010). The measure captures respondents' perceived gender abilities through asking them to draw someone they believe to be good at mathematics and again for reading. The current study applied similar techniques to children aged 8–9 years in UK primary (elementary) schools. Whilst drawings are clearly subjective, the quantifiable information came from boxes respondents had to tick to indicate whether the person they drew was male or female. Much like Beilock et al. (2010), findings indicated males were more likely to draw a male who is good at mathematics and females were more likely to draw a female good at reading. Respondents overall, however, were more likely on both occasions to draw someone good at mathematics or reading who shared the same gender to which they reported for themselves. Given the wealth of literature concerning the influence of parents on children's attitudes to mathematics, the measure was also explored with whether respondents stated if they received support in mathematics homework from parents. When comparing with overall Gender Ability Beliefs, males were more likely than females to express traditional beliefs, where a male was drawn as good at mathematics and a female was drawn as good at reading. It is therefore suggested that

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more research be carried out to draw an international comparison, both in the validity of the method and consistency in findings.

Literature

Why use drawings in surveys for children?

Research with children provides an array of considerations, such as the use of simple language and short sentences (Kellett, 2011), the time taken to complete the survey, and whether the perceptions of the child are being truly measured or the child understands what is being asked of them (Mabelis, 2019; Rolfe, 2006). Psychologists have used several techniques when surveying children, one being the Draw a Person Task, also known as Draw-A-Man Test (DAM). The DAM test was first known through the publication of Goodenough's (1926) attempts to measure the intellectuality of children (Harris, 1963). The measure was revised to assess children's physical and mental development, concluding the technique can be used by mental health professionals for assessment of young children (Harris, 1963). Despite a debate as to whether the task itself is a reliable tool for estimating children's intelligence (Reisman & Yamokoski, 1973), it does present an opportunity to engage the child in survey research through its interactive nature (Kellett, 2011).

In the current study, the method of drawing a person was required for children answering the survey, along with listing the gender of the person drawn. Specifically, the child was asked to draw a person of someone who they knew was good at reading and another of someone who was good at mathematics. Gender self-categorisation, which refers to labelling the self as a girl or boy (Perry et al., 2019), was used in the current research. Figure 1 provides an image of what child respondents saw and would have drawn in. Respondents were asked to state their drawn person's gender via a tick-box due to concerns of the technique measuring a child's intelligence or maturity at this age (Harris, 1963). The researcher's interpretation of the drawing would also not be enough as it could only be assumed what the gender of the person was. It was therefore decided that the child must clearly indicate whether the person had a gender and whether that gender was male or female by confirming this themselves. This was additionally necessary to provide the quantifiable evidence that would produce the measure of Gender Ability Beliefs (Beilock et al., 2010).

Sex segregation and gendered subjects

For decades, there has been exclusion separating literary intellectuals from scientists (Snow, 1959) alongside sex segregation (Reskin, 1993), which refers to the tendency of occupations held by men and women and a perception that one gender is more appropriate than another (Perez-Felkner et al., 2017). Both misrecognitions pose clear danger to learning of subjects and are still present amongst individuals (James, 2016). The distorted female-male polarity is argued to set early in childhood through individuals' associations of behavioural expectations assigned to a particular gender (Vasileva, 2022). Gendered subjects are evidenced in females having higher mathematics anxiety, even when ability increases (Beilock et al., 2010; Dowker et al., 2012), less high female math achievers in many different countries (Breda et al., 2018), and more recently in the UK, females having advantages in reading from early years of education (Breda & Napp, 2019). The issue of sex segregation in mathematics is not new to the UK and similar countries (Perez-Felkner, 2015), resulting in an underrepresentation of women in STEM sectors and less likely to study scientific subjects (Macdonald, 2014; McMaster, 2017).

Parental influence

The gendering process is said to start as soon as children can class themselves as one of the binary categories of assigned sex, which is claimed to be from two to three years old (Lipsitz-Bern, 1983 in

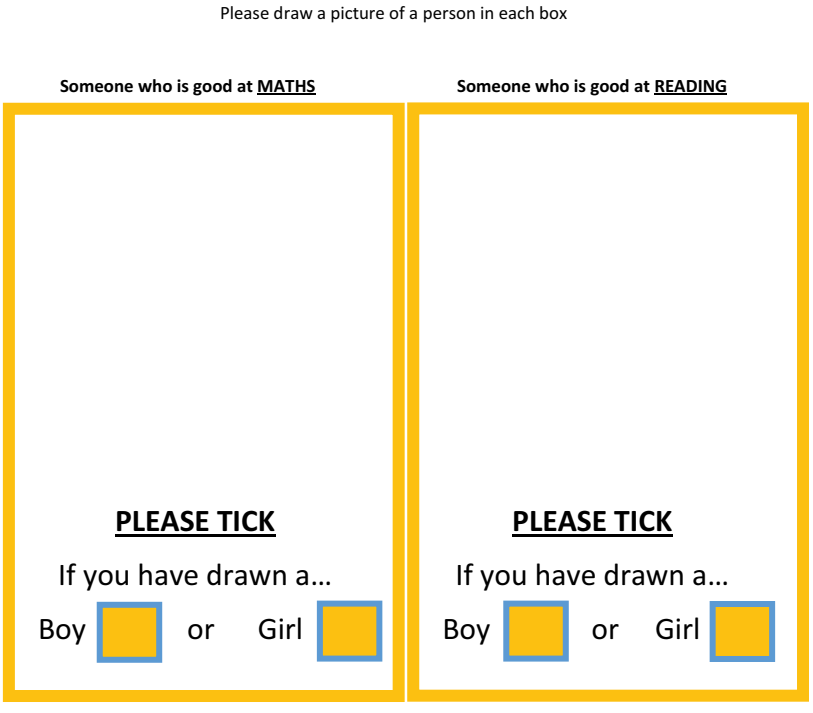

Figure 1. Self-completion method for Assigned Gender Ability Beliefs

Wingrave, 2018). Children are also argued to think about their assigned gender and respond based on how gender is presented to them in social contexts (O'Brien et al., 2000 in Wingrave, 2018) and a common method is emulating the behaviour of an adult with the same assigned gender (Bussey & Bandura, 1984; Perry & Bussey, 1979). Expectancy Value Theory (Eccles, 1993) highlights how parental influence from early years can establish attitudes in children to ensure their interests and motivations adhere to the expectations of parents, who are also gendered. An additional variable was therefore added to the study, where respondents stated whether their parents help with mathematics homework, which was used in the current study.

Explaining assigned gender ability beliefs and it's use to methodology

As discussed in the previous research (Chapman, 2016), the current study faced a significant barrier in how gender could be measured. Access was granted providing children stated their biological sex, which also had to be the case for the sex of the person they had drawn in the measure. Perry et al. (2019) discuss self-categorisation of gender, considering felt-same and felt-other gender typicality, citing Bem's (1981) findings of identifying the self as typical to both sexes being healthier than just one. There are also important considerations to be made of the well-being of children who do not identify with their assigned sex (Vasileva, 2022). Perry et al. (2019) also importantly highlight that gender identity refers to a self-reported and cognitive construct. Given the samples' age range of 8–9 years old, additional consideration has been made through a review of literature discussing the experiences of gender-based exceptions to a child's behaviour at this age, which is concerned more with biological sex. This issue was echoed during data collection in the current study where schools would only allow a binary measure to be used.

The current study applied an originally designed method from the US over two decades prior (Beilock et al., 2010), to UK children aged 8–9-years through a self-completion survey. Alongside

respondents' own gender self-categorisation (Perry et al., 2019), the study explored how young children's attitudes to gender ability might be measured in survey research through drawings. Whilst Beilock et al. (2010) named their measure Gender Ability Beliefs, the current research argues the assigned gender from biological sex at birth, its distinct polarity and associated expectations, are what reinforce sex segregation in younger years.

Gender ability beliefs can be considered as distinct attitudes if evidenced to be the result of a reinforced disposition (Stovkis, 1953), which if positive, helps establish confidence (Kalder & Lesik, 2011), resulting in more positive-reinforced dispositions that satisfy a sense of identity (Brewer, 1991; Smith & Hogg, 2008). However, if reinforced dispositions are established through negative experiences and not addressed by adult role models, children can learn to apply boundaries to their perceived ability often through the expectations of the gender they have been assigned (Smith & Hogg, 2008). These impacts go beyond the obvious educational disadvantages. Whilst issues of well-being were previously mentioned (Vasileva, 2022), negative experiences also impact career choices in restricting learner identity by seeing oneself as non-mathematical (Macdonald, 2014; Williams et al., 2008). Methodologically, we should consider Gender Ability Beliefs as a measurable factor when accounting for children's attitudes, beliefs or perceptions. More importantly, the current study wishes to ask how we should measure Gender Ability Beliefs and the associated challenges when researching the attitudes of young children in school settings.

Research questions

Following the discussion of literature, the study established the following research questions:

(1) Can we use drawings to measure children's Assigned Gender Ability Beliefs?
(2) Do Assigned Gender Ability Beliefs associate with Respondents' sex?
(3) Is the association between Assigned Gender Ability Beliefs and sex further mediated by parental help with mathematics homework.

Methods

Details of the measure

Adapting the work of Beilock et al. (2010), the measure aimed to produce a scale from −1 to 1 that would indicate whether a respondent perceived ability in mathematics and reading to be of a stereotypical nature – males good at mathematics and females good at reading. The current study wishes to examine the measurement of Assigned Gender Ability Beliefs in both a categorical and scale nature, whilst being further explored to see whether beliefs differ according to respondents' demographic factors. The scale of −1 to 1 was created by providing a score of 1 when a male was drawn and 0 for when a female was drawn. Given this is only a three-point scale, it was decided that it should also be explored as a categorical variable at this stage.

A formula was then applied which was:

$$\textit{Maths Drawing} - \textit{Reading Drawing} = \textit{Assigned Gender Ability Beliefs Score}$$

Whilst carrying out the same technique and formula as Beilock et al. (2010), it was decided not to provide any story of someone good at maths or reading for respondents to then draw. Instead, the child respondent had to simply draw anyone they wished without any context Table 1.

The purpose of the formula was to produce a scale that would then be used as a computed continuous variable or two individual categorical variables for drawings of someone good at mathematics or reading.

Table 1. provides the three possible scores that could result from the formula.

Maths Drawing Score	Reading Drawing Score	Assigned Gender Ability Beliefs
Boy (1)	Girl (0)	1
Boy (1)	Boy (1)	0
Girl (0)	Girl (0)	0
Girl (0)	Boy (1)	−1

Maintaining young respondents' engagement to increase reliability and validity

Like Massey (2022), the current research wished to consider innovative techniques that not only quantify complex information, but also ensure the child respondent remains engaged throughout. This is not only an example of good practice to yield reliability and validity through aiding the respondents' concentration (Kellett, 2011), but also an ethical consideration to ensure the child knows what they are taking part in (Mabelis, 2019; McLeod, 2009). It is important to clarify that the information of interest was more the quantifiable ticked box that simply indicated whether the drawing was male or female, for the formula to build the Assigned Gender Ability Beliefs scale. An important acknowledgement to be made is the fact that the scale is only currently three points: −1, 0 and 1. This is due to the desire to apply Beilock et al. (2010) original formula to modern research in addition to resistance from schools for non-binary measures to be considered. Upon reflection, along with the need to consider how we measure gender in younger years, it is suggested that more detailed analyses could take place to assess the characteristics of the drawings, both in quantitative and qualitative nature.

Methods of analysis

Exploratory statistics were used to assess sample characteristics and how Assigned Gender Ability Beliefs was answered. Given that the measure is only a three-point scale ranging from −1 to 1, the current study wishes to open discussion as to how such a variable should be analysed. For this article, percentages were used when treating as categorical whilst the mean value was used when treating as continuous, at both univariate and bivariate analysis. For the purposes of exploration, analysis has taken place testing the measure as both continuous and categorical to identify whether significant associations differ according to the use of the measure. The variables discussed were used as independent variables to a study of attitudes to mathematics, which can be found in Massey (2022).

Inferential bivariate analysis was then conducted, using Chi-Square tests of independence to assess whether the gender drawn for mathematics and reading was significantly associated with respondents' gender and whether they received parental support with mathematics homework. Paired sample *t*-Tests were then used when treating the measure as scale, assessing whether the average score between −1 and 1 significantly differed between males and females, as well as whether respondents said yes to being asked if they received support from parents with mathematics homework. Properties of the measure were analysed in addition to a missing data analysis. Finally, multivariate analysis was conducted through binary logistic regression to assess whether respondents' gender predicted a likelihood of drawing a particular gender for mathematics and again for reading, along whether this was further mediated by whether they had received parental support with mathematics homework. Linear regression was also carried out to assess whether gender and parental support predicted an overall score of Assigned Gender Ability Beliefs, to explore how we should use the measure given it is only a three-point scale. All the analysis was carried out on IBM SPSS Statistics 27 and can be found in the appendices.

Procedure

Surveys were completed physically and destroyed on school premises following transferring data on to an encrypted IBM SPSS Statistics file. Following the work of Kellett (2011) and Mabelis (2019), the research took a stance on ensuring procedures treated child respondents were no different to adults in providing the same opportunity to exercise their informed consent and right to withdraw, whilst ensuring good practice in allowing parents to withdraw their children if they wished following establishing access via heads of schools. To avoid socially desirable responses (Steenkamp et al., 2009), the researcher ensured adults could not help respondents answer the survey, including teachers. Respondents were asked to answer the surveys on physical copies with pencil and were informed not to provide their names to ensure anonymity. The procedures were carried out with stringent effort to ensure ethical obligations were met, to assess reliability and validity of data and to maximise respondents' comfort in providing honest responses.

Missing data analysis

Whilst missing data analysis comes in many forms or options, the current research focused on the problem of item non-response (Dong & Peng, 2013) given the reliance on multi-item scales and potential for varied levels of missing data depending on the measure used. Such issues were not avoided when using the current measure, which was only two items. Missing data was analysed by assessing the respondents who did not answer both items. This was computed into a variable and further dichotomised to have those who answered the whole measure as one group whilst merging those who partially answered or didn't at all answer as the second group. Analysis of frequency tables identified that 8.5% of the sample failed to answer the whole measure, which is not over the 10% threshold that suggests potential bias (Bennett, 2001). In addition, other multi-item scales measuring attitudes to mathematics were also all under 10%.

Respondents who failed to completely answer other attitudinal measures in the study were also less likely to answer Assigned Gender Ability Beliefs. This was identified through crosstabulations and Chi-Square tests of independence between Assigned Gender Ability Beliefs and measures of attitudes to mathematics. In addition, Independent Sample *t*-Tests identified no significant differences in average attitudes to mathematics scores between those who answered the Gender Ability Beliefs measure and those who didn't (coded as missing). Additional analysis was carried out by assessing whether there was a significant difference in overall Assigned Gender Ability Beliefs score between two groups: those who fully answered the multi-item attitudinal measures and those who didn't, of which no significant difference was identified. More details can be found in supplementary material.

Ethical considerations when working with children

In addition to the extra care that should be taken when working with young participants (Felzmann, 2009; Kellett, 2011; Wendler & Wertherimer, 2017), the view taken in the current research was that children should be given the same rights and autonomy as any consenting adult to make them as respondents as aware of possible of their participation and rights through fully informed consent (McLeod, 2009; Scott, 2013). Specifically, accessing pupils followed a three-step process, involving schools, parents and the respondents.

The first, like much research in the field of education, was negotiating access with school gatekeepers and receiving informed consent to ask respondents to take part (Morrow, 2009). This permission was granted by heads of schools, using devolved consent to enter school premises to request respondents aged 8 and 9 years to answer a self-completion questionnaire following reading an information sheet designed for their reading age.

Prior to visits taken place, parents were provided a minimum of two-weeks' notice, along with researcher contact details and an information sheet to provide sufficient time to understand the nature of the research and withdraw their child from the study if they wished. If a parent withdrew their child from the study, they could do so through notifying the researcher, school or both. On any occasion, the child was not included in the data collection process. Various reasons were given for children not to take part and cannot be disclosed to ensure anonymity and confidentiality.

Whilst consent from school gatekeepers and parents right to withdraw had been exercised, the respondents were then provided their own opportunity to consent in taking part as is their right (Rolfe, 2006). The researcher, in the presence of classroom teachers, made it explicitly clear to pupils that the self-completion questionnaire was not in any way their schoolwork and the responses they provided did not contribute to any grades, nor would they be read by their teacher or any school member of staff. They were also reminded that they should not provide their names to protect their anonymity. Respondents were informed that by completing the self-completion questionnaire, they were consenting to the responses being used for research only and that their responses would always remain anonymous.

Sampling strategy

Participants were of 8–9 years old in what is regarded as Year 4 amongst UK primary schools. At the school level, purposive sampling was used in attempts for national comparability. However, the average percentage of free school meals for the overall sample was 22.95%, identified as significantly higher than the national average at the time of data collection (13.7%) through a one sample *t*-Test ($p < .001$). Random sampling proved to be an additional challenge due to the limited number of schools granting access for research visits. Reasons for not allowing visits often related to time and pressure constraints of the schools along with time and resource constraints for the researcher. Reasons for granting the visits differed with the most common being a desire to understand pupils' attitudes better due to demographic diversity of the schools' pupils and lack of resources to do so. Whilst desired for the particular methodology, simple random sampling was therefore not used and caution is taken when using the inferential methods in this article. However, whilst parametric inferential tests have been used to provide a methodology suitable for random sampling, non-parametric tests were also conducted and echoed the same results on every occasion, provided in the appendix.

Results

The study assesses a sample of 508 respondents using a self-completion questionnaire from 11 different schools across the North West of England. The sample was relatively split in terms of gender, with 51% of the sample self-reporting as female and the remaining 49% male. Respondents were asked to state their own gender by indicating whether they were a boy or girl, as requested by the schools' permitting access. As discussed in the literature review, it is important to acknowledge that only a binary measure (male/female) of gender was provided. Whilst a more fluid measure of gender would have been used, school gatekeepers asked that only a binary measure be used. The paper wishes to currently explore the use of drawings for self-reported characteristics to pose questions for future research as to how gender should be measured through these techniques. Most of the sample (63.5%; $n = 283$) also indicated to receive parental support with mathematics homework.

Initial findings of the draw a person task can be found in Table 2. Most of the sample drew males as someone good at mathematics (57.7%, $n = 276$) and females to be good at reading (61.4% $n = 286$). It was clear that there were more stereotypical beliefs in males to be good at maths and females to be good at reading. However, when computing a total Assigned Gender Ability Beliefs score, the

Table 2. Exploratory statistics

	Percentage	n
Gender		
Male	49.1%	243
Female	50.9%	252
Parental Support		
Yes	63.5%	283
No	36.5%	163
Someone good at Maths		
Boy	57.7%	276
Girl	43.3%	202
Someone good at Reading		
Boy	38.6%	180
Girl	61.4%	286
Assigned Gender Ability Beliefs		
−1 (Maths=Boy; Reading=Girl)	15.5%	72
0 (same genders for both)	50.5%	235
1 (Maths=Girl; Reading=Boy)	34%	158

Table 3. Assigned Gender Ability Beliefs by gender

Assigned Gender Abilities		Male	Female
Drawing of someone good at Maths***	*Male*	85.8%	31%
	Female	14.2%	69%
Drawing of someone good at Reading***	*Male*	59.4%	19.4%
	Female	40.6%	80.6%
(Mean Assigned Gender Ability Beliefs Score*)		(.26)	(.11)

* = p < .05 *** = p < .001.

most popular response was in fact drawing the same gender for both reading and mathematics. This is explained and discussed further in bivariate analysis.

Bivariate analysis

Gender

Table 3Table 3 shows males were more likely to draw a male good at maths (85.8%, $p = .000$) whilst females were more likely to draw a girl good at reading (80.6%, $p = .000$), echoing findings from the original study of Beilock et al. (2010). It was however noted that males were also more likely to draw males for someone good at reading, whilst females were more likely to draw females as someone good at maths.

When treating Gender Ability Beliefs as categorical, on both occasions for drawing someone good at mathematics and reading, findings indicated respondents were simply more likely to draw someone of the same gender they had self-reported. When treating gender ability beliefs as scale through an overall score between −1 and 1, a significant difference was identified through an Independent Samples *t*-Test. Males' average score was found to be significantly higher than that of

Table 4. Parental support

Assigned Gender Abilities		Receive parental support	No parental support
Drawing of someone good at Maths	*Male*	54.7%	62.3%
	Female	45.3%	37.7%
Drawing of someone good at Reading*	*Male*	35.3%	46.3%
	Female	64.7%	53.7%
Mean Assigned Gender Ability Beliefs Score		.19	.15

* = p < .05.

Table 5. Regression

Logistic Regression	Odds ratio (*p* value)	R2
Male Good at Mathematics		**.39**
Male	14.78 **(.000)**	
Received Parental Support with Mathematics Homework	1.25 (.397)	
Male good at Reading		**.21**
Male	5.59 **(.000)**	
Received Parental Support with Mathematics Homework	.812 (.367)	
Linear Regression		
Assigned Gender ability beliefs (scale)		**.01**
Male	174 **(.011)**	
Received Parental Support with Mathematics Homework	.082 (.249)	

females ($p = .025$), providing evidence to suggest males had more stereotypical Assigned Gender Ability Beliefs.

Parental support

63.5% of the sample stated their parents helped them with mathematics homework. Table 4Table 4 shows 54.7% of those who said they received parental support with mathematics homework drew a picture of a male to be someone who was good at mathematics. There was however no significant association between parental support and drawing a picture of someone good at maths ($p = .125$). A significant association was identified between gender ability beliefs and drawing a picture of someone good at reading, where 64.7% of those who stated their parents helped with mathematics homework drew a female as someone who was good at reading ($p = .027$). When treating the measure as a scale, an independent sample *t*-Test identified no significant difference in average Assigned Gender Ability Beliefs score between those who do or do not receive parental support with mathematics homework.

Multivariate analysis

As can be seen from table 5table 5, binary logistic regression models assessed whether gender and parental support were found to associate with the drawn gender of someone good at mathematics and again for reading, whilst a multiple linear regression model assessed whether respondents' gender and parental support in mathematics homework associated with Assigned Gender Ability Beliefs when treated as continuous.

Male good at mathematics

The dependent variable in the model was coded so that the reference group was those who drew a female as someone they knew to be good at mathematics. 39% of the variance in drawing someone good at mathematics was explained by the two factors. Males were found to be almost fifteen times more likely than females, when accounting for parental influence, to draw a male good at mathematics. Parental support was not found to significantly influence drawing someone good at mathematics when accounting for gender.

Male good at reading

A similar process was carried out for drawings of people good at reading. For consistency in models, coding remained the same; females were used as the reference group in the dependent variable. 21% of the variance in drawing someone good at mathematics was explained by the two factors. Males were found to be almost six times more likely to draw a male good at reading, whilst parental

support was not found to significantly influence drawing someone good at reading when accounting for gender.

Overall assigned gender ability beliefs

When using the computed total scale variable, only 1% of the variance was explained by the two factors, gender and receiving parental support, whilst the overall fit of the model was found to be significantly different (better) when including the predictors vs without ($p = .032$). Further analysis identified males to have a significantly higher score than females, indicating more traditional gender ability beliefs when accounting for the influence of parental support ($p = .011$; B = .174). Like reading ability and mathematics ability, parental support was not found to relate to overall Assigned Gender Ability Beliefs when accounting for gender.

Discussion

Using draw a person task to measure more abstract concepts with children provides alternative strategies in quantitative methods with self-completion techniques. Analysis of missing data provided no evidence of patterns between those able or not to answer the whole measure completely, with those who answered the measure more likely to answer other more complex multi-item scales. In addition, the current study suggests that males between 8 and 9 years old are more likely to possess more stereotypical Gender Ability Beliefs, resonating findings from previous literature concerning females' lacking confidence in mathematics abilities or socialisation influencing children to possess more stereotypical beliefs such as Eccles (1993), Beilock et al. (2010), Dowker et al. (2012), Macdonald (2014) and Breda and Napp (2019).

For years, the UK has suffered from polarised learner identities, where one can only possess skills in the arts or the sciences, not both (Macdonald, 2014; Snow, 1959). Over 50 years later, literature echoes the same argument (Perez-Felkner et al., 2017; Williams et al., 2008). Questions yet to be asked, however, are how such distorted views continue, how the polarity often becomes gendered (Macdonald, 2014; McMaster, 2017), how we best capture this methodologically and how such issues differ internationally. The current study provides an example of quantitative research that can be applied to younger years albeit with a binary measure of gender more aligned with biological sex. However, findings nonetheless indicate children are more likely to perceive people of their own self-reported gender to be good at both reading and mathematics from as young as eight years old.

The influence of parental support and why more research is needed

No significant association was identified between parental support and respondents' drawings of someone good at mathematics in either bivariate or multivariate analysis. Previous research has identified impacts on attitudes to mathematics from parents (Eccles, 1993; McMaster, 2017; Menheere & Hooge, 2010), with different methods being used. Given the introduction of methods used in the current study, more research should be carried out before any strong inferences are made as to whether parents impact children's attitudes as young as eight years old.

A significant association was identified between parental support and drawing someone good at reading, where 64.7% of those who said they receive support from parents drew a female good at reading. This finding was further supported through multiple binary logistic regression, taking account for the control of parental support, where females were almost 15 times more likely to draw a female as someone who is good at reading. Breda and Napp (2019) suggested females have a natural advantage in reading at younger ages whilst Dowker et al. (2012) identified females' confidence in mathematics decreased in school from age 7–10, despite abilities increasing, suggesting influence to be social over biological. Eccles (1993) expectancy value theory poses a potential explanation, where the expectations of parents can lead to gendered performances, including

females and reading, which could equally be argued as an expectation assigned to a gender based on sex (Smith & Hogg, 2008; Vasileva, 2022).

Like drawing someone good at mathematics, overall Assigned Gender Ability Beliefs were not found to associate with parental support, providing some evidence to suggest that parental influence does not play a part in respondents' views on mathematical gender abilities like it does reading. The study unfortunately did not ask respondents if their parents helped with reading homework, which is why it is suggested more research be carried out.

Conclusion

The current study found that we can use drawings to measure children's Assigned Gender ability Beliefs (RQ1) and that these beliefs are significantly associated with respondents' self-reported gender (RQ2), whilst suggesting more research be carried out in assessing the influence of parents (RQ3). The use of drawings enabled participant involvement through child-centred methods (Kellett, 2011) and quantifiable information from tick-boxes, with evidence of validity presented through missing data analysis and substantive findings echoing that of previous literature. Criticisms must also be made. Whilst non-binary measures of gender were considered, this received resistance from school practitioners due to for worry about confusing students of this age. The same argument can, however, be made with the use of binary measures for those who do not identify with their assigned sex (Vasileva, 2022). This could also become more complex when considering family background, including ethnicity (Regmi, 2003). The paper therefore provides options for researchers when using self-completion techniques with young respondents along with methodological issues to explore in future study. Data from the current study suggest drawings can be used in quantitative self-completion studies, using Assigned Gender Ability Beliefs as an example, whilst presenting an opportunity to consider how we do this with more validity and internationally.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributor

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