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Stereo-atypical: An Investigation into the Explicit and Implicit Gender Stereotypes in Primary School-Aged Children

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Abstract

Gender stereotypes established early in childhood have a profound impact on a child's sense of self-definition: they commonly influence behaviours regarding academic pursuit and career aspirations. The aim of the current study was to investigate the emergence of explicit and implicit gender stereotypes in children aged 5–8 years. Fifty-four children were recruited from a primary school in Manchester, United Kingdom. Four occupations (scientist, nurse, athlete, singer) and their corresponding personality traits (intelligence, empathy, athleticism, confidence) were examined. Explicit bias was measured using a forced-choice preference task. Implicit bias was measured using the Implicit Association Test. Binomial tests showed that explicit biases emerged amongst the youngest of pupils. Using a Four-Way ANCOVA, it was found that both boys and girls showed an implicit preference for males towards the Athlete domain only. These findings were discussed with reference to a sociocultural perspective through Social Learning Theory, and a cognitive framework through Gender Schema Theory.

Keywords Gender stereotypes · Gender schema theory · Social learning theory

Introduction

As children enter the world, they absorb cues of gender, continuously searching for social rules and behaviours which are appropriate, if not expected, of each gender group (Martin et al., 2002). They develop a sense of self through this lens. Children acquire gender knowledge in a form that is exponentially rapid, surpassing their understanding of other significant categories such as those based on ethnicity, nationality, religion, or race (Baron et al., 2014). Children try to develop categories based on similar characteristics (known as schemas) in order to build an understanding of their world (Piaget, 1952). In regards to gender stereotypes, children often develop these to have a generalization to base their knowledge off of; that is, children take in physical characteristics and social ideas about gender to develop their own meaning of what that means (Meyer & Gelman, 2016). Given vast changes in socialization over the past decade, this paper aims to determine whether traditional gender stereotypes are still prominent amongst primary school-aged children, or instead whether these stereotypes more closely align with changes in society.

Gender

Gender is a social construct that typically associates behaviours with femininity and masculinity. However, gender is not classified on a binary scale. An individual is not restricted to being male or female, and there are multiple ways in which one may express their gender identity (e.g., agender, gender non-binary, etc.). Gender is different to sex; only recently has literature focused on gender fluidity and non-binary gender identities among children (Diamond, 2020). We acknowledge that young children's perception of gender may be more expansive than just the binary, and simplifying experiences of gender by suggesting male and female can be detrimental. However, for the present research,

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gender is considered binary so as to decipher traditional stereotypes associated with males and females.

Gender Stereotypes

Stereotype Threat

Conceptualising gender into two separate and distinct entities creates a barrier for young children to pursue certain aspirations. For example, occupations centered around Science, Technology, Engineering and Mathematics (STEM) attract an overwhelming number of males (> 70%) in comparison to females (< 30%) (Sassler et al., 2017). Using a sample of primary school-aged children (5–7 years old), Bian et al. (2017) collated gendered perceptions towards intelligence: an admirable trait when pursuing a career in STEM-related fields. Women were perceived as being less intellectually gifted than men—this stereotype was present in children as young as 6 years of age. Subsequently, these biases diminished levels of interest in girls to pursue an occupation whose members represented intelligence.

Hively & El-Alayli (2014) reported females severely underperformed at athletic tasks when this stereotype was made salient. The common stereotype equates athleticism with masculinity rather than femininity (Biddle et al., 2011). Strikingly, holding a negative stereotype in this domain of athleticism not only has consequences for female participation in sports, but has also shown to impede athletic performance. This phenomenon, known as stereotype threat, explains how behaviour has also been shown to be manipulated by fear of conforming to the negative stereotypes of one's social group (Régner et al., 2014). In this vein, stereotype threat can also affect children and their cognitive performance (Eisenberg & Lennon, 1983).

Empathy is the ability to understand the emotional state of another. This characteristic is frequently attributed to females rather than males (Koenig, 2018). In a study conducted by Eisenberg & Lennon (1983), children either verbally reported their emotional state or pointed to pictures depicting facial expressions. When activating the negative stereotypic perception, male responses to affective stimuli—a hypothetical picture or story—were significantly weaker than female responses. However, when empathy was measured physiologically (skin conductance response) or through covert observations of nonverbal reactions, there was no evidence of gender differences (Eisenberg & Lennon, 1983). This underscores the impact of stereotype threat on performance and subsequently reducing future career aspirations due to misperceptions in the ability to empathize (Halpern & Perry-Jenkins, 2016). Regarding the latter, men are severely under-represented in roles pertaining to health care and domestic functions—occupations whose members cherish empathy (Croft et al., 2015). Research has provided insights into how young children might be affected by gender stereotypes through forms of stereotype threat, and beliefs regarding future pursuits.

Adult Influences

Eccles et al. (1983) suggest a continuous cyclical trend to explain the development of stereotypes, whereby early emerging gender differences are facilitated by adult behaviour (Halpern & Perry-Jenkins, 2016). For example, Duffy et al. (2001) observed interactions between physical education teachers and pupils. Data showed that teachers placed a greater emphasis on male pupils regarding involvement and encouragement in sports. Therefore, it is not surprising that young boys develop the perception that they possess greater athletic abilities than girls (Knisel et al., 2009). Cimpian et al. (2016) found that classroom teachers consistently rate young girls' mathematics ability below that of boys—these biases were reflected through overt praise, attention and encouragement favouring male pupils. Martin & Halverson (1981) posit that such reinforcement communicates to children that there is a divide between girls and boys with regards to their expected actions—this inevitably fosters stereotypical beliefs about gender (Spears-Brown & Stone, 2016). Career ambitions were already limited by the age of seven: ingrained beliefs discourage young children from breaking out of the stereotype (Davies et al., 2002). Therefore, it is postulated that early acquisition of biases—intentional or coincidental—will result in a stronger influence on future behavioural aspirations (Olsson & Martiny, 2018). Consequently, it is of great interest to define the emergence of gender biases amongst children, so as to prevent assumptions that are fundamentally irrational or illusory.

Explicit and Implicit Beliefs

Best et al. (1977) define a linear function of gender stereotype development, indicating a chronological increase from ages 5–11 years. Gender stereotypes are defined as holding attitudes, beliefs and expectancies towards the characteristics and behaviours of males and females (Halpern & Perry-Jenkins, 2016). To date, a systematic method has been employed to determine this trajectory: a matching task whereby children verbally sort images of items, symbols, or people into gender categories. This measure is useful for testing explicit attitudes that require a conscious response. Adopting this method, Garrett et al. (1977) found that younger children—ages 4–6 years—held rigid stereotypes, with boys selecting traditionally masculine roles (e.g., fireman), and girls selecting traditionally feminine roles (e.g., nurse). Children between 7–9 years of age were more flexible in their beliefs about gender in the workplace. This can

be explained by the cognitive structural development which occurs during this time (Huitt & Hummel, 2003). Younger children may not hold the capacity to accept neutral jobs; rather, each occupation is categorized into "only male" or "only female." However, recent literature fails to replicate these findings (Bian et al., 2017).

Furthermore, Dunham et al. (2016) outline several limitations of using purely explicit measures to assess gender stereotypes: responses might be (1) skewed by self-presentation concerns or (2) limited by one's awareness and control of their emotional state (Nosek et al. 2007a, 2007b). Essentially, a large proportion of the professional literature has failed to explore implicit gender attitudes amongst children. The term implicit attitude encompasses automatic thoughts made unconsciously, without deliberate processing (Dunham et al., 2016). Therefore, it is imperative to gain insight into the development of both explicit and implicit stereotypes towards gender, underscoring the extent to which each process shapes a child's emerging sense of self-concept (Baron et al., 2014).

In further support of this notion, Ellemers (2018) showed that implicit attitudes across multiple domains are not concurrent with explicit attitudes. In this study of adult participants, when men were asked to rate competence levels between gender, most were reluctant to explicitly claim that women are less competent. However, their implicit attitudes failed to replicate. Ellemers (2018) concluded that implicitly held stereotypes overrule explicit statements. In a similar vein, Endendijk et al. (2014) found that caregivers self-reported that they raised boys and girls equally. However, these explicit statements did not correlate with their implicit beliefs and subsequent behaviour, whereby there were clear differences between how they raised girls and boys, for instance, when disciplining. As children tend to mimic the unconscious behaviors of their guardians, Liben & Bigler (2002) suggest that early developmental experiences may shape implicit cognition before explicit biases emerge (Halpern & Perry-Jenkins, 2016). This highlights a gradual dissociation between implicit and explicit attitudes, and the subsequent notion that implicit attitudes may develop at a different time. The present issue of isolating measures results in a narrow approach to asserting the true emergence of gender stereotypes—whether the earliest attitudes may form purely implicitly, explicitly, or in co-existence.

To investigate this matter further, Miller et al. (2009) compiled data using implicit and explicit measures. Across both measures, Miller et al. (2009) argued that the typical 5-year-old child has awareness of various gender stereotypes and tends to endorse these in a rigid and absolute manner until the age of seven. From 7 years and onwards, Dunham et al. (2016) reported an age-related shift towards egalitarianism regarding explicit attitudes only—implicit attitudes remained stable across ages. Moreover, a pilot study conducted by Cvencek et al. (2011a), (2011b) found an implicit own-gender preference in 4 and 5-year old boys, but not girls, with regards to their mathematical abilities and self-concept. On the other hand, Bian et al. (2017), found that both boys and girls at the age of five and younger did not explicitly discriminate in their stereotypical perceptions when assessing the same variables. It was not until 6–8 years where children began to show a preference for gender- specific traits, for instance, self-reporting males with higher intelligence, and females with higher empathy (Meyer & Gelman, 2016). These findings were in contrast to those of Garrett et al. (1977), who found that younger children held more rigid stereotypes, with males rating neutral job classifications as more male oriented. However, recent pilot work from Durham University found that 6–8-year-old children were showing an explicit bias, whereas younger children aged four to five did not (Watson, 2018). This is in line with the research of Bian et al. (2017). Discrepancies between implicit and explicit measures can be explained by an age-related shift (Dunham et al., 2016). However, Skowronski & Lawrence (2001) highlight the enigma of which attitude, implicit or explicit, is the 'true' one.

One measurement used to assess implicit gender bias is the implicit association test (IAT) (Greenwald et al., 1998). The original IAT is a computerised program which compares response times in a dichotomous categorization task. Each trial combines a concept classification (e.g., male versus female) with a second concept (e.g., scientist versus nurse), represented in pictures or words (Cvencek et al., 2011a, 2011b). The IAT measures, indirectly, the strength of association between concepts.

Theories of Gender Stereotype Development

Social Learning Theory

One theoretical framework that serves to clarify the development of gender stereotypes is Social Learning Theory (SLT) (Bigler & Liben, 2006). It states that children learn gender cues from observing and imitating role models in their immediate environment, including parents, teachers, or within a school or child-care setting. Albert & Porter (1988) reported the effects of rewards and punishments depending on whether the child behaved gender-appropriately in their household. Here, conformity to gender-congruent behaviours led to the strengthening of stereotypical beliefs; this was in line with the principles of operant conditioning (Skinner, 1953). Taken together, gender stereotypes develop through learned compliance or non- compliance reinforcement, as well as vicarious learning. However, the SLT fails to account for a child's flexibility in interpretation of society's gender rules throughout development.

Gender Schema Theory

Bem (1981) reformed the Gender Schema Theory (GST), constituting of both cognitive and social factors. It conjects that gender stereotyping derives, in part, from schematic processing of gender-relevant stimuli. A schema is defined as a cognitive structure that forms associations and facilitates the organization of information (McVee et al., 2005). Children learn to echo their behaviours and preferences in terms of their gender schema—then, they evaluate their adequacy as a boy or girl against the prototypes stored within the schema (Martin et al., 2002). According to the GST, a boy who chooses to engage with a toy car will believe that cars are "for boys," so if "I am a boy," then "cars are for me." Martin and Halverson (1981) studied 48 children aged 5–6 years who looked at images of masculine and feminine jobs. When assessing a child's gender-role preference, children tended to manipulate information that was inconsistent with their schema by changing the gender of the stimuli. For example, if there was a male actor in a nurse setting, children would later recall the actor to be a female. Gender schemas have a cognitive influence on the properties of memory retention (Martin & Halverson, 1981). However, caution is required when generalizing these results as it can be argued that during the free-recall trial, children used their knowledge about which gender is typically associated with the type of activity, reflecting not their stereotype, but individual differences in personal experiences and respective ability to retain information. Nonetheless, GST has been focal in demonstrating how schemas of gender can lead to stereotyping.

Media Influences

It is also plausible that the media propagates gender stereotypes across young minds. Peterson & Lach (1990) reviewed a wide range of children's books and stated that male characters were often portrayed as active and competent, while female characters were portrayed as passive and incapable. Children who were exposed to these books demonstrated more stereotyped attitudes about gender roles. Comparatively, Barclay (1974) found that children who were consistently exposed to neutral stories showed reduced gender stereotyping. Similarly, in the modern era, television programs are known to be central to a child's everyday routine. Many programs transmit stereotypes about gender. Wille et al. (2018) assessed the impact of a range of televised programs on young children. In the study, 344 primary-school aged children were divided into two conditions: (1) exposure to a programme which offered gender-stereotypical scenarios, for instance, a girl seeking help from a male peer, and (2) exposure to a neutral programme. The findings were as predicted: pupils who were exposed to gender stereotypes in their television programmes reported an increased endorsement of the same. Conclusively, the media has a long-standing reputation of facilitating stereotypes in young children; this closely aligns with SLT, whereby a virtual environment contributes to their learning of how each gender should behave in an ideal world.

Campbell et al. (2002) recognized the importance of assessing multiple domains within the same study. This is critical to any explanation of a developmental pattern: assessing a child's knowledge within one domain (i.e., trait) may predict their subsequent behaviours in another (i.e., occupation). One occupation, singer, is stereotyped as being a feminine activity (Franklin, 2019; Koenig, 2018). Although Abril (2007) claimed that confidence is a core trait when pursuing singing as a career, Cold et al. (1980) found that across ages, participants attributed higher confidence to males than females. A gender paradox between the occupation of singer and the desired trait of confidence warrants further clarification.

Current Study

In order to address the issues outlined, the current research assesses both explicit and implicit measures of different types of personality traits and occupations, in relation to gender biases in young children. Four occupations—scientist, nurse, athlete, and singer—were chosen along with their corresponding traits—intelligence, empathy, athleticism, and confidence—to expand upon previous research which assess only a single type of occupation or trait. The IAT (Greenwald et al., 1998) was modified by replacing words with images, symbols, and audio recordings to depict gender, occupation, and personality traits respectively, to suit the age sample. The age range (5–8 years) was chosen because there have been discrepancies underlying the emergence of gender stereotypes within this range. Therefore, the current study aims to clarify the developmental interaction between implicit and explicit measures and investigate gender stereotypes in primary school-aged children (5–8 years). The first hypothesis states a gender stereotype that associates males with scientists, intelligence, athletes, and athleticism, and females with nurses, empathy, singers, and confidence. The second hypothesis states that younger participants will not show an explicit gender bias. The third hypothesis states that an implicit gender bias will be present in both younger and older children.

Methods

Design and Participants

For explicit measures, an independent design was employed with age group and gender as independent variables (IV),

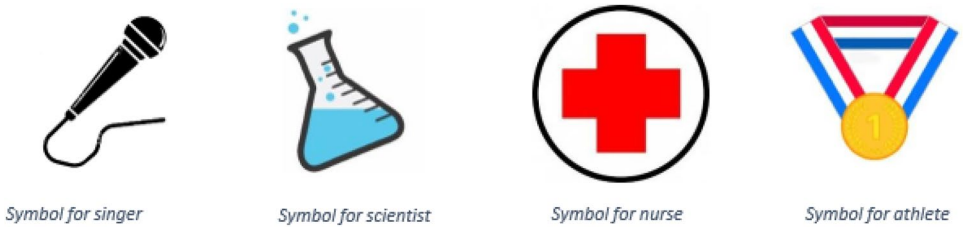

Fig. 1 Four symbols to represent each of the four respective occupations

and the dependent variable (DV) were the responses indicated by participants when pointing to an item on the screen. For implicit measures, the IVs were age as covariate, gender, and explicit responses. For the DV, D-scores were calculated as a measure of implicit bias (see Sect. 4.6). The participants were 54 children (22 males, 32 females) aged between 60 and 96 months ($M = 79.95$, $SD = 9.61$) recruited through convenience sampling from a primary school in Manchester, UK. The inclusion criteria were pupils aged 5–8 years who were fluent in English, taking part in regular classes at the school. The exclusion criteria were pupils who are suspected of having Special Education Needs.

Ethical Considerations

The study received approval from the Durham University Department of Psychology Ethics Committee. Informed consent, in the form of opt-in consent given by caregivers, was obtained prior to participation. Child participants were made verbally aware about their right to withdraw at any time and for all data to be destroyed. This was also expressed through the information sheet given to caregivers. Data was anonymized at the point of collection and stored safely. After the study was completed, participants were fully debriefed using the age-appropriate debrief sheet.

Materials

A laptop was used to administer the experiment. The screen size was 15.6 inches with 100% brightness and 1366:768 screen resolution. Two red stickers with a diameter of 1.5 cm were placed on the respective response keys on the keyboard. A standardised recording sheet was used to record the results of the explicit test. A vocabulary comprehension test was administered to test understanding of key terms. Audio stimuli were categorized into two groups: Type A and Type B. Type A referred to the trait-like characteristics of the occupation. A type A audio stimulus for nurse was "taking care of people," for scientist was "being really clever," for athlete was "being very sporty" and for singer was "entertaining people." Type B referred to the actions involved in the occupation. A type B audio stimulus for nurse was "working in a hospital," for scientist was "doing experiments," for athlete was "winning trophies" and for singer was "making music." An association task was employed to determine whether the pupil can identify between four symbols associated with each occupation. In this task, pupils were required to verbally match an occupation to the correct symbol. The symbols below were referred to in the child-modified IAT (child-IAT) (Greenwald et al., 1998) (see Fig. 1).

Explicit Test

Microsoft PowerPoint was used to present four images (two males and two females, deemed by the researchers as constant in terms of age, skin and hair colour, attractiveness) under which various questions were asked following a brief description. For each trial, a different set of male and female images were used. An example of a question relating to intelligence was, "Who is most likely to be intelligent?" Prompts which appeared written on the PowerPoint slide were verbally repeated by the experimenter. Participants were asked to point to the image which most closely fit the prompt.

Implicit Test

Two stickers were placed on the "D" key and the "@" key, for left and right response commands respectively. Audio recordings were presented in full volume instead of written sentences to standardize instructions given to each participant. There were two practice phases: Practice Phase 1 (10 trials) consisted of matching names which are unambiguously male or female to an image of a male or female person. For example, if the audio recording spoke "John," participants were to press the response key concurrent with the male image (see Figs. 2, 3).

Practice Phase 2

(9 trials) In this phase, participants were required to match an audio description (e.g., Which of these jobs involves taking care of people?) to an occupation symbol (e.g., nurse).

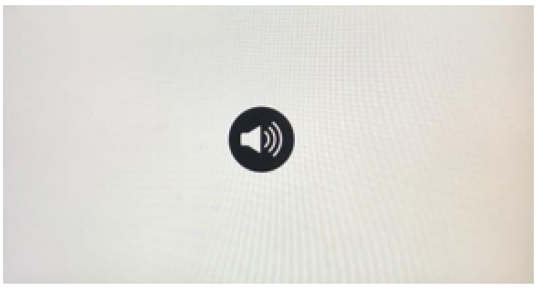

Fig. 2 Audio screen when participants are listening to the prompt. For example, a name, "John" is presented acoustically

Fig. 3 Response screen when participants are choosing either the male image or the female image

The Experimental Phase

(30 trials: 15 congruent and 15 incongruent) In this phase, participants were required to match an audio description (e.g., taking care of people) with an occupation (e.g., nurse). Participants were encouraged to focus on the occupation rather than the male or female images. To control for order effects, the congruent and incongruent critical blocks were randomized across participants.

Procedure

Prior to the experiment, children were divided into Year Level groups. One at a time, participants were escorted from their classroom to the testing room. The testing room was a quiet space allocated by a member of staff, who was present at all times during testing. The experimenter gave a thorough verbal overview of the procedure and what is required of the participant. Participant gender, age and anonymous ID was recorded. First, the vocabulary comprehension test was administered orally. Then, participants were given the explicit measures test. After a 30 s break, participants were required to complete the association task. Next, the child-IAT was run. The experimenter reiterated that responses should be made promptly, yet accurately. Upon completion, participants were debriefed, given a certificate of participation, and were escorted back to their classroom, each session took no longer than 30 min.

Data Collection

The following data was collected: age (in years and months), gender (male or female), response key (left or right) and response time (RT; in milliseconds/ms). Some trials may be prone to longer RTs due to a lack of concentration or distraction. Therefore, as part of standard practice, response latencies above 4000 ms were capped; this was suggested by Greenwald et al. (2003) who recoded latencies outside boundaries of 3000 ms for adult participants. The current study extends this by 1000 ms due to the nature of working with children and the use of acoustic phrases rather than presented words. For any incorrect responses, defined as not classifying the appropriate response key to the target occupation, an additional 600 ms was added onto the RT (Williams & Steele, 2016). A D- score was calculated by subtracting the incongruent RT from the congruent RT, to obtain a measure of 'total incongruence effect' (Greenwald et al., 2003). This measure is based on the principle that two categories which are mentally associated will be quicker to respond to, rather than two categories which are not. Positive values of a D-score will indicate a longer RT to the incongruent trials compared to the congruent trials. Therefore, the larger the positive D-score value, the higher the degree of implicit bias held.

Results

Implicit Measures Analysis: Paired-Samples t-test

Type A Stimuli

A paired samples t-test was conducted for congruent A stimuli trials versus incongruent A stimuli trials. Results of the t-test show that there was no significant difference for the RT measure between congruent and incongruent trials, $t(53) = 1.282$, $p = 0.206$.

Type B Stimuli

A paired samples t-test was conducted for congruent B stimuli trials versus incongruent B stimuli trials. Results of the t-test show that there was a significant difference for the RT measure between congruent trials and incongruent trials, $t(53) = -2.142$, $p = 0.037$. Incongruent trials led to a significantly longer RT ($M = 1320.84$, $SD = 482.83$) compared to the congruent trials ($M = 1251.69$, $SD = 432.32$).

Table 1 Explicit binary measures of younger female participants (M = 72.63, SD = 4.33) attitudes towards traits and occupations

	Gender	N	Observed percentage	Exact sig (2-tailed)
Intelligence	Female	9	60	.607
	Male	6	40	
Athleticism	Female	6	40	.607
	Male	9	60	
Confidence	Female	13	87	.007
	Male	2	13	
Empathy	Female	10	67	.302
	Male	5	33	
Nurse	Female	13	87	.007
	Male	2	13	
Scientist	Female	3	20	.035
	Male	12	80	
Athlete	Female	1	07	.001
	Male	14	93	
Singer	Female	11	73	.118
	Male	4	27	

Table 2 Explicit binary measures of older female participants (M = 86.06, SD = 6.79) attitudes towards traits and occupations

	Gender	N	Observed percentage	Exact sig (2-tailed)
Intelligence	Female	7	41	.629
	Male	10	59	
Athleticism	Female	1	06	.000
	Male	16	94	
Confidence	Female	13	76	.049
	Male	4	24	
Empathy	Female	15	88	.002
	Male	2	12	
Nurse	Female	16	94	.000
	Male	1	06	
Scientist	Female	6	35	.332
	Male	11	65	
Athlete	Female	3	18	.013
	Male	14	82	
Singer	Female	17	100	.000
	Male	0	0	

Explicit Measures Analysis: Binomial Tests

A binomial test was conducted for the explicit measures. Age was divided using a median split. For females, the median age was 77 months and for males the median age was 81 months.

Females

Tables 1 and 2 display the explicit attitudes of the younger and older female participants respectively, towards traits and occupations. The Gender column in Tables 1 and 2 refer to whether female participants chose a male or female image when presented with the description of each trait and occupation.

For the intelligence trait, there was no significant difference between participants picking male or female images in both the younger and older age groups. For the athleticism trait, there was no significant difference between participants picking male or female images in the younger age group. In the older age group, the percentage of participants picking a male image (94%) was significantly higher than those picking a female image, $p < 0.001$.

For the confidence trait, both younger (87%, $p = 0.007$) and older (76%, $p = 0.049$) female groups displayed a significant preference in picking a female image over a male image. For the empathy trait, there was no significant difference between gender images picked in the younger age group. In the older group, the percentage of participants picking a female image (88%) was significantly higher than those picking a male image, $p = 0.002$.

For the occupation of nurse, both younger (87%, $p = 0.007$) and older (94%, $p < 0.001$) age groups displayed a significant bias towards picking a female image. For the occupation of scientist, the younger age group picked a male picture (80%) significantly more than a female picture, $p = 0.035$. In the older age group, there was no significant difference. For the occupation of athlete, both younger (93%, $p = 0.001$) and older (82%, $p = 0.013$) female groups displayed a significant difference in picking a male image over a female image. For the occupation of singer, there was no significant difference between gender image picked in the younger age group. In the older group, there was a significant difference where the female image was chosen unanimously (100%) over the male picture, $p < 0.001$.

Males

Tables 3 and 4 display the explicit attitudes of the younger and older male participants respectively, towards traits and occupations. The Gender column in the table refers to whether male participants chose a male or female image when presented with the description of each trait and occupation.

For the intelligence trait, there was no significant difference between participants picking male or female images in both the younger and older age groups. For the athleticism trait, there was a significant difference in the younger age group, whereby the male image was chosen unanimously

Table 3 Explicit binary measures of younger male participants (M = 71.92, SD = 5.58) attitudes towards traits and occupations

	Gender	N	Observed percentage	Exact sig (2-tailed)
Intelligence	Female	4	36	.549
	Male	7	64	
Athleticism	Female	0	0	.001
	Male	11	100	
Confidence	Female	8	73	.227
	Male	3	27	
Empathy	Female	7	64	.549
	Male	4	36	
Nurse	Female	9	82	.065
	Male	2	18	
Scientist	Female	1	09	.012
	Male	10	91	
Athlete	Female	1	09	.012
	Male	10	91	
Singer	Female	10	91	.012
	Male	1	09	

Table 4 Explicit binary measures of older male participants (M = 90.45, SD = 4.80) attitudes towards traits and occupations

	Gender	N	Observed percentage	Exact sig (2-tailed)
Intelligence	Female	8	67	.388
	Male	4	33	
Athleticism	Female	3	25	.146
	Male	9	75	
Confidence	Female	10	83	.039
	Male	2	17	
Empathy	Female	9	75	.146
	Male	3	25	
Nurse	Female	10	83	.039
	Male	2	17	
Scientist	Female	3	25	.146
	Male	9	75	
Athlete	Female	0	0	.000
	Male	12	100	
Singer	Female	10	83	.039
	Male	2	17	

(100%) over the female image, $p < 0.001$. In the older age group, there was no significant gender bias.

For the confidence trait, there was no significant difference between picking male or female images in the younger age group. In the older age group, there was a shift in explicit bias towards females, where the female image was chosen significantly more (83%) than the male image, $p = 0.039$. For the empathy trait, there was no significant difference between participants picking male or female images in both the younger and older age groups.

For the occupation of nurse, the younger age group tended to pick female images (82%) over male images. This was approaching significance, $p = 0.065$. In the older age group, there was a significant difference, whereby female images were picked more (83%) than male images, $p = 0.039$. For the occupation of scientist, the younger age group picked a male image (91%) significantly more than a female image, $p = 0.012$. In the older age group, there was no significant gender bias. For the occupation of athlete, both younger (91%, $p = 0.012$) and older (100%, $p < 0.001$) male groups displayed a significant difference in picking a male image over a female image. For the occupation of singer, both younger (91%, $p = 0.012$) and older (83%, $p = 0.039$) male groups displayed a significant difference in picking a female image over a male image.

Implicit Measures Analysis: ANCOVA

For each occupation, a four-way ANCOVA was conducted with gender, explicit binary variable for trait and explicit binary variable for occupation as IVs, with age as a covariate. During the explicit task when participants chose either a male or female image, a binary variable was calculated. This explicit binary variable for trait and occupation was used to determine whether there was a relationship between explicit gender attitudes and implicit RTs. The DV was the difference between congruent and incongruent trials for the occupation in the IAT. A larger D-score represents a higher level of unconscious bias. For all variables, normality of the DV using the Shapiro-Wilks test is not significant. Therefore, normality is assumed. For all variables, the Levene's test is not significant, therefore equal variances is assumed. All assumptions of the ANCOVA were met.

Table 5 ANCOVA statistical results with gender, explicit binary measures of athleticism and explicit binary measure for athlete as IVs, and age as a covariate

	F	df	*p*	η^2
Age	12.319	(1, 46)	.001	.211
Gender	0.885	(1, 46)	.772	.002
Explicit Athleticism	2.552	(1, 46)	.117	.053
Explicit athlete	1.785	(1, 46)	.118	.037
Gender × athleticism	1.265	(1, 46)	.267	.027
Gender × Athlete	0.126	(1, 46)	.725	.003
Gender × athleticism × Athlete	0.347	(1, 46)	.559	.007

Athlete

In Table 5, the term Athlete refers to the occupation and the term Athleticism refers to the trait. There was a significant main effect of age on D-scores for athlete, $F(1,46) = 12.319$, $p = 0.001$, $\eta^2 = 0.211$, representing a large effect size. A correlation was conducted between age and D-scores for athlete. There was a significant positive correlation, $r = 0.430$, $p = 0.001$, indicating that as age increased, the RT measured by the D-score increased. There was no significant main effect of gender on D-scores for athlete. No significant interaction effects were found.

Scientist

In Table 6, the term Scientist refers to the occupation and the term Intelligence refers to the trait. There were no significant main effects or interaction effects were found.

Nurse

In Table 7, the term Nurse refers to the occupation and the term Empathy refers to the trait. There were no significant main effects or interaction effects were found.

Singer

In Table 8, the term Singer refers to the occupation and the term Confidence refers to the trait. There were no significant main effects or interaction effects were found.

Discussion

This study investigated whether children of a primary school age held gender stereotypes. The first hypothesis stated a general stereotype associating males with scientist, intelligence, athlete, and athleticism, whilst associating females with nurse, empathy, singer, and confidence. The second hypothesis stated that younger participants would not show an explicit bias. The third hypothesis stated that an implicit gender bias would be present in both younger and older children. The hypotheses were, in part, supported. This discussion will delve into variations of the findings to offer a comprehensive insight into the development of gender stereotypes.

Table 6 ANCOVA statistical results with gender, explicit binary measures for intelligence and explicit binary measure for scientist as IVs, and age as a covariate

	F	df	*p*	η^2
Age	1.674	(1, 45)	.202	.036
Gender	0.040	(1, 45)	.842	.001
Explicit Athleticism	3.742	(1, 45)	.059	.007
Explicit athlete	0.247	(1, 45)	.622	.005
Gender × athleticism	0.213	(1, 45)	.646	.005
Gender × Athlete	1.084	(1, 45)	.303	.024
Gender × athleticism × Athlete	0.682	(1, 45)	.511	.029

Table 7 ANCOVA statistical results with gender, explicit binary measures for empathy and explicit binary measure for nurse as IVs, and age as a covariate

	F	df	*p*	η^2
Age	2.748	(1, 45)	.104	.058
Gender	0.005	(1, 45)	.944	.000
Explicit Athleticism	0.323	(1, 45)	.572	.007
Explicit athlete	0.588	(1, 45)	.447	.013
Gender × athleticism	0.629	(1, 45)	.432	.014
Gender × Athlete	0.016	(1, 45)	.901	.000
Gender × athleticism × Athlete	0.218	(1, 45)	.805	.010

Table 8 ANCOVA statistical results with gender, explicit binary measure for confidence and explicit binary measure for singer as IVs, and age as a covariate

	F	df	*p*	η^2
Age	0.087	(1, 46)	.769	.002
Gender	0.127	(1, 46)	.723	.003
Explicit Athleticism	1.698	(1, 46)	.199	.036
Explicit athlete	0.378	(1, 46)	.542	.008
Gender × athleticism	1.179	(1, 46)	.283	.025
Gender × Athlete	0.324	(1, 46)	.572	.007
Gender × athleticism × Athlete	0.865	(1, 46)	.357	.018

Explicit and Implicit Biases

There was no bias, implicit nor explicit, reported for the personality trait intelligence, failing to replicate the findings of Cvencek et al. (2011), Cvencek et al. (2011)). However, an explicit bias was reported amongst younger male and female participants regarding the corresponding occupation of scientist. An explanation is offered through a sociocultural lens, which underscores the effect of observational or direct learning on behaviours, draws attention towards the type of school conditions in which children were present. After analyzing the curriculum of Years One, Two and Three, there was evidence for positive reinforcement of female participation in STEM. For example, Year Ones (ages five-six) completed a project, "Little People, Big Dreams," which focused on female leaders

and civil right activists, while Year Twos and Year Threes (ages six-eight) read *Hidden Figures* (Shetterly, 2016)—a non- fiction book centered around four Black women and the space race. Children became aware of female scientists and leaders. Research suggests that a child develops their sense of self and gender identity largely through the behaviours which are learned and reinforced in schools (Dunham et al., 2016).

School Influence

To clarify, Galdi et al. (2013) tested the extent to which the school environment can shape gender stereotypic beliefs. Children were divided into three conditions: (1) colouring a picture of a boy solving a mathematics problem, (2) colouring a picture of a girl solving a mathematics problem, or (3) a control condition. Children who coloured a picture depicting a girl succeeding in mathematics automatically reduced stereotypical associations. These findings, in conjunction with Gawronski & Bodenhausen's (2006) theory of associative and propositional learning, demonstrate how introducing gender empowerment within the school curriculum can nurture gender neutral beliefs as shown in the current research. Accordingly, Gawronski & Bodenhausen (2006) state that a child's cognitive map encompasses of associative links which rely heavily upon repeated exposure or co-occurrences stimuli of in their social environment. This inference could also explain why younger males and females exhibited an explicit bias towards males in the occupation of scientist: by having less(er) exposure to counter stereotypical education, younger children may only be accumulating information from caregivers or via mass media (Ruble et al., 2007) (see Figs. 4 and 5).

Caregiver Influence

In this vein, parents and caregivers are important agents of socialization (Halpern & Perry-Jenkins, 2016). Chick et al.

Fig. 4 Example of an incongruent trial. In these trials participants were presented with previously viewed images of men and women as well as symbols depicting an occupation, where the image of a man was underneath the nurse or singer symbol, while the image of a woman was underneath the athlete or scientist symbol

Fig. 5 Example of a congruent trial. In these trials, participants were presented with previously viewed images of men and women as well symbols depicting an occupation, where the image of a man was underneath the athlete or scientist symbol, while the image of a woman was underneath the nurse or singer symbol

(2002) observed interactions between caregivers and children. Girls were reinforced for their appearance and nurturing behaviours, whilst boys received praise over their size and physical abilities. This may shed light onto why empathy and the corresponding occupation of nurse were stereotypically associated with females, whilst athleticism and the corresponding occupation of athlete were stereotypically associated with males. Upon closer reflection, however, the current study showed male participants -irrespective of age—did not report a bias towards empathy. This may be due to principles of cognitive balance which can result in counter stereotypical beliefs—for example, if a boy engages in the thought "If I am warm and I am male" then he will also engage in the thought that "men are warmer than women."

Here, GST may serve to explain why boys rejected the stereotype in the current study (Bem, 1981). Furthermore, Bigler (1995) found that using a forced- choice preference task which requires children to directly compare genders can prime thinking about competition and promote in-group favouritism. However, a paradox presents itself as this study yielded no significant gender preference: some males continued to perceive empathy as a female-dominated trait. A subsequent explanation for this would be positive attachment to their maternal caregiver. Rudman & Goodwin (2004) explored the influence of early maternal experiences on gender attitudes. They found that pro-maternal evaluations promoted pro-female evaluations in affective domains. Therefore, it is plausible that individual differences in approaching the task, or early experiences, can result in a cumulative non-significant bias.

Confidence

The personality trait of confidence alongside the corresponding occupation of singer was examined due to unresolved stereotypical associations. The current findings

show no implicit gender preferences within either domain. However, explicitly, the general trend showed that boys and girls had a female preference for both confidence and singer variables. The explicit data sheet shows a clear pattern regarding the Singer variable. 48 Children chose a female image—of these, 41 children chose image number four. During the experiment, a few children mentioned that image number four looked like "she was on stage, she must be a singer." Therefore, it is unknown whether children hold an explicit gender bias towards the occupation of singer, or if they chose purely based on their (mis) interpretation of the image.

Cultural Influence

Cultural roots may influence children's responses towards gendered traits and occupations. A majority of participants represented a Western, middle-class cohort. Culture determines which stereotypes are most salient (Ambady et al., 2001). For example, Del Rio and Strasser (2013) found Japanese children (aged six) perceived boys to be better than girls in mathematics, but this stereotype was not present within American children of the same age. As aforementioned, mathematics ability equates to high intelligence, therefore suggesting that in the Japanese or Asian culture, the stereotype linking males to intelligence emerges earlier than in the American or Western culture. This may explain why there was a gender-neutral response towards intelligence in the current study. On the other hand, Dawar and Anand (2014) recruited participants from India and assessed stereotypes within occupations and social role domains.

There was a unanimous stereotype for roles traditionally performed by women at home, including cooking, washing clothes, and the occupation of nurse. At the same time, 80% of children perceived athleticism to be a male-dominated trait. These findings more closely align with the current research which showed boys' and girls' preference for females regarding the occupation of nurse, and preference for males regarding the occupation of athlete. Future research would benefit from delving into cultural aspects and ethnography of gender stereotypes: there may be similarities and differences across cultures depending on the type of domain or variable assessed. In the case of this study, it can be assumed that the Western culture has adopted a neutral perspective for the intelligence variable, but not for the occupations of nurse and athlete.

In another vein, the percentage of women in the United Kingdom who work in STEM-related careers increases by an average of 15% every year (Bilimoria & Liang, 2014). On the implicit measure of analysis, this study yielded a neutral preference towards the occupation of scientist and corresponding trait of intelligence. Children have a heightened sensitivity to adults' nonverbal or nonconscious behaviours, which Rudman (2004) claims is an important channel through which automatic attitudes are formed. As "times have changed" and with both males and females achieving greater equality within nonconscious behaviours, children are less likely to form stereotypes (Haines et al., 2016).

Gender Influence

Over the last 30 years, women's participation in athletics has increased, while men's participation in the nursing industry has also increased (Whittock & Leanard, 2003). However, both younger and older children continued to show an explicit bias for the occupations of nurse and athlete. Moreover, there was a significant implicit bias towards the occupation of athlete, with the caveat that as age increased, implicit biases increased alike. This was particularly unusual as Dunham et al. (2016) argued that implicit attitudes remain relatively stable across time. Hence, with regards to Athlete domain, Apostolou and Zacharia (2015) considered an evolutionary approach: males have evolved to watch athletic competition between other males in order to determine the best fit for their allies.

Similarly, Apostolou and Zacharia (2015) conducted a survey and found that both genders preferred watching men compete across all athletic events. This inference, coupled with media coverage data which states that 90% of sports television hours are devoted to men's sports (O'Reilly, 2012), places emphasis over why the Athlete domain is perceived to be male-dominated across both implicit and explicit measures. More specifically, young boys gain more attention from physical- education teachers (Duffy et al., 2001). Therefore, as children are continuously exposed to nonconscious behaviours which reinforce athleticism as a male-dominant trait, this not only translates into, but strengthens their implicit stereotype of the same.

Limitations

Although the present study chose to focus on how the majority of children perceive gender as essentially "boy traits" and "girl traits," it is worth mentioning that defining gender as a binary construct is a societal issue. Recent literature has delved into the damaging effects of restricting gender to either male or female domains, specifically for children and adults who identify as gender non-binary. For example, Carlile (2020) found prolonged anxiety and distress amongst young children who experience misgendering and deadnaming. Furthermore, Paechter et al. (2021) suggest that young children and adolescents struggle to

express their non-binary identities at school. More specifically, the school curriculum is strongly binary, and students who did not conform to binary expectations were left feeling invisible, unsafe, and faced bullying (Paechter et al., 2021). For this reason, the current study focuses on traditional gender representation, aligning with the school curriculum and majority perceptions of gender. The use of a traditional perspective of gender identity could perpetuate perspectives of the simplistic binary. In related future research, it may prove beneficial to address more complex understandings of gender; especially since research is lacking in the field.

Second, although cultural differences in gendered stereotypes have been acknowledged, the methodology in this current study included stimuli featuring white persons. Therefore, caution is required when interpreting the results because choosing stimuli across different races or ethnicities may have led to different conclusions. However, the rationale for choosing White men and women is threefold: (1) remain consistent with the methodology of previous research (see Bian et al., 2017), (2) images of other races may evoke different behavioural responses to that of the participant's race, and (3) the population of the catchment area where the school is located was majority White. In regards to the latter, the experience of culture for children in the school may therefore be predominantly White, and the use of familiar faces would decrease the risk of confounding results. It cannot be assumed that the stereotypes established in this paper remain for other populations of varying races and ethnicities, nor whether participants would hold the same stereotypes toward other races and ethnicities. It is imperative that future research clarifies how race and ethnicity interjects with perceptions of gender.

The lack of correlation between implicit and explicit measures raises the question: "Which is the real attitude?" Rudman (2004) claim that non-controversial topics (e.g., flowers) leads to a higher correlation between measures than controversial topics (e.g., race, gender). However, Nosek et al. (2007a), (2007b), claim that young children do not have self-presentational concerns. Differences between implicit and explicit responses may be due to the experimental paradigm—individual differences in literacy levels, understandings, and cognitive control might have hindered the task from effective completion.

In retrospect, the use of a modified IAT may be considered a methodological limitation of the study. The child-IAT involved reducing the number of trials to accommodate for young participants with limited attention spans (Dunham et al., 2014). However, a reduced number of trials can lead to increased variability in responses. In order to ensure reliability and validity of IAT responses, it is recommended that future research consider the amount of trials in conjunction with the stimulus (i.e., the number of descriptions per occupation, or the number of occupations assessed). Additionally, it is unclear whether IAT responses reflected knowledge, or endorsement of a stereotype. Future studies would benefit from employing a scale which assesses purely knowledge, before measuring implicit bias. For example, the Sex Stereotype Measure (Williams et al., 1975) is used to gauge children's knowledge of gender stereotypes.

Future Directions

One strength of the current study was including a large range of stimuli. Four variables were explored in each domain, compared to previous literature which has only looked at one variable (Bian, 2017). This enabled researchers to delve into how stereotypes can develop at different times, or at different strengths, depending on the variable. The present research has several implications for promoting gender neutral beliefs amongst children. It showed that children are reactive to the school curriculum. Therefore, teachers should reinforce girls for athletic interests through the physical- education curriculum, whilst educating boys on career pathways which have been traditionally female dominated. Since a child's immediate environment is a strong predictor of their gender beliefs, future research will profit from gathering information about caregivers, lifestyle, or observing day-to-day interactions. For example, the occupation of a caregiver might play a role in the child's subsequent beliefs about gender in the workplace. This would determine where and how a child develops stereotypes, proving useful for intervention if required.

Conclusion

The child-IAT created for this study encompassed two types of stimuli: Type A stimuli pertained to the trait-like characteristics of the occupation as opposed to Type B which pertained to activities involved in the occupation. The latter produced a significant effect, whereby incongruent trials led to a longer RT than congruent trials. It is postulated that between 3 and 6 years of age, gender-typed knowledge of toys and activities increases rapidly (Dunham et al., 2016). In the current research 67% of participants were of ages six or below. Furthermore, Miller et al. (2009) found that children learnt stereotypes within the domains of activities and toys before mastering stereotypes within the domain of traits. These inferences may explain why children were more inclined to show a gender bias with Type B stimuli than Type A. However, despite this,

there was no implicit bias found in the domains of Scientist, Nurse and Singer.

One explanation provided by current research suggests that children responded with a greater bias on the explicit measure rather than implicit: asking children to directly compare their gender suggests there must be a difference, forcing them to make a preference in order to comply with the demands of the task (Dunham et al., 2016). Comparatively, in the current child-IAT, children were required to match an audio description to an occupation, with gender as an indirect variable. This factor may also explain why younger children showed explicit biases. Overall, the present research investigated the development of gender stereotypes amongst primary school-aged children. Responses were varied and contingent upon the domain, with some children endorsing stereotypes, and others showing a more neutral perspective. There was an explicit bias reported in younger age groups for a proportion of variables tested, and an implicit bias was present only for the Athlete domain, therefore it cannot be concluded that there is a difference between measures in terms of emergence.

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Data Availability Data is stored with the first author.

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Declarations

Conflict of interest None.

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