Received: 18 July 2023 | Revised: 31 January 2024 | Accepted: 5 April 2024

DOI: 10.1002/dys.1766

SHORT REPORT

WILEY

Investigating low intelligence stereotype threat in adults with developmental dyslexia

Barbara Piotrowska[1] | John Barratt[2]

[1]School of Applied Sciences, Edinburgh Napier University, Edinburgh, UK

[2]School of Psychology & Vision Sciences, University of Leicester, George Davies Centre (GDC), Leicester, UK

Correspondence
Barbara Piotrowska, School of Applied Sciences, Edinburgh Napier University, 9 Sighthill Ct, Edinburgh EH11 4BN, UK.
Email: b.piotrowska@napier.ac.uk

Funding information
Edinburgh Napier University

Stereotype threat (ST) is a phenomenon that leads to decreased test performance and occurs when one deals with added pressure of being judged on the basis of stereotyped group membership. The ST effect has been previously investigated in many contexts but not in individuals with dyslexia who are often stereotyped as less intelligent. Prevalent use of intelligence tests in job selection processes and employment gap between people with dyslexia and those without warrants this investigation. Sixty-three participants (30 with dyslexia and 33 without dyslexia; mean age = 33.7; SD = 13.7; 47 F, 13 M, three non-binary) were asked to complete intelligence test typically used in selection processes. All participants were randomly assigned to one of three test instruction conditions: (1) they were told the test was diagnostic of their intelligence (ST triggering instruction); (2) test was a measure of their problem-solving skills (reduced threat); (3) or they were simply asked to take the test (control). Results showed that participants with dyslexia in ST condition performed poorer than those in other conditions and those in the same condition who did not have dyslexia. This study provides preliminary evidence for diminishing effects of ST in individuals with dyslexia.

KEYWORDS
developmental dyslexia, inclusion, intelligence test, job selection, stereotype threat

Practitioner Points

- People with dyslexia are often stereotyped as having low intelligence which may make them vulnerable to stereotype threat (ST) effect.
- ST occurs when there is added pressure of being judged on the basis of one's group membership.
- People with dyslexia may perform worse on intelligence tests due the fear of confirming low intelligence stereotype.
- People with developmental dyslexia should be made aware of ST effect and trained on how it could be alleviated.
- Instructions preceding intelligence tests should be neutral or frame test as measuring learnable skills to assure fairness of job selection.

1 | INTRODUCTION

Developmental dyslexia (DD) is primarily seen as a reading difficulty that persists into adulthood and is independent of intelligence level (IDA, 2007). Yet, there is a prevailing stereotype that people with dyslexia have low intelligence (Shifrer, 2013; Tanner, 2009). This has potential consequences for their job prospects. In 2016 the unemployment rate for people with learning difficulties (including dyslexia) was 14.6% which markedly contrasted with 5.2% of general UK population (ONS, 2016). Some research showed that people with DD work in jobs below their qualifications and earn less than those without DD (De Beer et al., 2014). Our understanding of how potential candidates with DD approach challenges related to job application processes is minimal. As it is a common practice to include intelligence tests as part of job selection process, people with DD may be disadvantaged due to their concern of being judged on the basis of their group membership, a phenomenon known as stereotype threat (ST). ST effect has been found in many stereotyped groups (Hough et al., 2001; Jensen, 1998; Ramist et al., 1994; Roth et al., 2001; Sackett et al., 2001; Valencia & Suzuki, 2001) but has not been explored in people with dyslexia.

1.1 | Dyslexia and low intelligence stereotype

Individuals with dyslexia can show a combination of difficulties affecting their learning processes (British Dyslexia Association, 2007) but research shows that these difficulties occur independently of their intelligence (Pennington, 2006; Shaywitz et al., 1992; Stuebing et al., 2002). Further, DD is associated with a range of social and emotional consequences that go beyond the disorder itself (Livingston et al., 2018). Individuals affected by DD report challenges related to negative perception of dyslexia because western societies particularly value intellect and ability (Leitão et al., 2017). Some suggest that stereotyping is more emotionally damaging than the primary difficulties with reading (McNulty, 2003; Nalavany et al., 2011).

Individuals with DD would make assumptions on how others see them and hence they would underestimate their own abilities (Lockiewicz et al., 2014; Shifrer, 2013). This may start early in school where teachers' negative implicit attitude towards struggling readers may lead to harsher marking, unwillingness to help (Hornstra et al., 2010) or even changes to the way they teach (Gwernan-Jones & Burden, 2010). Poor readers reported being put into 'special classes' with kids who had intellectual impairments as their teachers believed dyslexia was an intellectual disability (Tanner, 2009). Family and peer mocking of DD's intelligence has been also reported (Tanner, 2009). Such reactions are internalised often having long-term negative impacts on people's sense of power, ability and self-esteem (Humphrey, 2002; Reeve, 2006; Tanner, 2009).

1.2 | Stereotype threat

ST is the fear of confirming a negative stereotype attached to a group one belongs to or associates with (Schmader, 2010). Such a threat may occur in evaluative situations (Steele, 1997; Steele & Aronson, 1995) and it may result in decreased performance on tasks that are difficult and in which people are negatively stereotyped (Nguyen & Ryan, 2008). An actual stereotype does not have to be held by others; the sole concern that one may be stereotyped is enough to experience ST (Kalokerinos et al., 2014). Test instructions reminding people about the stereotype or even asking them to indicate their group membership before engaging in setereotype-relevant activity may trigger ST (Steele et al., 2002; Stricker, 1998).

Several underlying mechanisms explaining ST effect have been suggested in literature. When reminded of a stereotype, individuals become aware that their group membership, and the specific stereotype that is attached to that group, may be relevant in a given context. Then they may become more attentive to the environment in case there was any potential for discrimination against them (Casad & Merritt, 2014). Both consideration and appraisal of the situation at cognitive and emotional level may increase their awareness of the stereotype which then may lead to the increased sense of threat (Inzlicht, Good, et al., 2006) and vigilance that may be manifested by physiological response such as increased blood pressure or constriction of blood vessels (Blascovich et al., 2001; Croizet et al., 2004; Murphy et al., 2007). For one to overcome ST they have to put a lot more effort, motivation, attention and self-control to maintain the same level of performance (Inzlicht, McKay, et al., 2006; Inzlicht & Kang, 2010; Muraven et al., 1998; Muraven & Baumeister, 2000).

Steele et al. (2002) suggested that the theory of ST refers to a universal reaction of members of any stigmatised social group and that findings can be generalised from one group to another. This effect has indeed been found across a range of contexts and groups. The most researched are race and ethnic minority groups who are stereotyped as less able and intelligent (Hough et al., 2001; Jensen, 1998; Roth et al., 2001; Sackett et al., 2001). Other investigated groups and their stereotyped abilities include women's maths ability (Gresky et al., 2005), women's driving (Yeung & von Hippel, 2008), White men's athletic ability (Stone et al., 1999) and older people's memory (Hess et al., 2003). Marginal differences were also found in students with learning disabilities (also including those with dyslexia but not only) performing verbal reasoning task (May & Stone, 2010) but no research has been conducted thus far on dyslexia.

Understanding of ST effect helps explain performance gaps between stereotyped and non-stereotyped groups, but it may also lead to helpful interventions. One way of alleviating the ST effect is to reframe the task and its instructions. Research shows that by removing references to threatening and stigmatising aspects of the tasks (e.g., intelligence), explicitly stating that the task is non-diagnostic or fair or that it is a measure of a malleable skill rather than of a stable trait such as intelligence (Hong et al., 1999; Johns et al., 2005; Steele & Aronson, 1995) may reduce the impact of ST. Training people to attribute their difficulties to external, rather than internal, factors has also shown positive effects of alleviating ST (Casad & Bryant, 2016; Walton & Cohen, 2007; Wilson et al., 2002).

1.3 | Use of intelligence tests in selection processes

Research on selection processes showed that intelligence tests are strongly predictive of job performance and training success for most occupations (Gottfredson, 2002; Hunter, 1983; Hunter & Hunter, 1984; Murphy, 2002; Ones, 2005; Ree et al., 1994; Salgado, 2017; Salgado et al., 2003; Salgado & Anderson, 2003; Salgado & Moscoso, 2019; Schmidt, 2002; Schmidt & Hunter, 1998; Wagner, 1997) which translates to practitioners' practices as the latest survey showed that 37% of companies use verbal and/or intelligence assessments in their selection processes (CIPD, 2020). Research, however, shows that intelligence test results may favour some groups of applicants over others (Hough et al., 2001; Jensen, 1998; Roth et al., 2001; Sackett et al., 2001; Valencia & Suzuki, 2001). As selection processes should be based on fair and relevant criteria through which best candidates are selected, it is pivotal to investigate how some potentially irrelevant criteria, such as learning difficulty, may affect these processes.

Indeed, issues around diversity and equality have been amongst the biggest challenges in organisations (Caven & Nachmias, 2018). CIPD survey (2020) reported that only 28% of companies adjust their recruitment processes to be more inclusive of minority groups and yet this inclusivity mostly focuses on issues of gender and race, not invisible disabilities such as dyslexia.

1.4 | The current study

Given that individuals with dyslexia are stereotyped as less intelligent, stereotype threat has potential to hinder their performance on intelligence tests that are typically used in selection processes. This is investigated here using established paradigm of tailoring test instructions to trigger (emphasising intelligence diagnosticity of the test) or reduce (emphasising the problem-solving focus of the test) stereotype threat and compare them to neutral test instructions (control). For comparison, individuals with and without DD participated. The key hypothesis was formulated:

> **H1.** There will be an interaction between group (individuals with and without dyslexia) and instruction condition (designed to trigger or reduce ST or act as control) in relation to intelligence scores.

2 | METHODS

2.1 | Participants

Overall, 63 participants took part in the study (47 females, 13 males, 3 non-binary; mean age = 33.70; SD = 13.70). Thirty participants that formed 'dyslexic group' had formal diagnosis of dyslexia (on average diagnosed at the age of 21; SD = 12.12). Thirty-three participants reported no reading problems and therefore formed 'non-dyslexic group'. There was no significant difference in intelligence score between different educational levels, $F_{(5,49)} = 2.208$; $p = 0.068$. Further demographic details are provided in Table 1. Participants were randomly assigned to one of three test instruction conditions. Participants were recruited through various social media (Twitter, Facebook) and advertising via dyslexia charity websites (e.g., Dyslexia Action and Dyslexia Scotland).

3 | DESIGN

The study utilised a between-subjects quasi-experimental 2 × 3 design. There were two independent variables: IV_1—group (dyslexia vs. no dyslexia); IV_2—test instructions (ST = Stereotype Threat; RT = Reduced Threat; C = control). The dependent variable was intelligence test total score.

3.1 | Materials

3.1.1 | Experimental manipulation: Test instructions

Test instructions for three conditions were based on those used by Ployhart et al. (2003) and May and Stone (2010). To trigger ST, the test was presented as diagnostic of intelligence. Reduced threat (RT) condition included information about problem-solving which is not a stereotype-relevant ability and is seen as a malleable rather than a stable trait (May & Stone, 2010; Ployhart et al., 2003). Control group was presented with neutral instructions. Instructions started with the general information (same for all conditions): 'You are invited to take a test on the next page. Please

TABLE 1 Participant demographic information presented by group and instruction condition.

	Participants with DD ($N = 30$)			Participants without DD ($N = 33$)		
Condition	**ST ($N = 7$)**	**RT ($N = 13$)**	**C ($N = 10$)**	**ST ($N = 14$)**	**RT ($N = 7$)**	**C ($N = 12$)**
Age in years mean (SD)	39.14 (17.01)	30.62 (11.36)	28.60 (12.13)	34.57 (12.36)	38.29 (10.97)	34.42 (17.98)
Gender	3 F, 3 M, 1 non-binary	10 F, 3 M	8 F, 1 M, 1 non-binary	9 F, 4 M, 1 non-binary	6 F, 1 M	11 F, 1 M
Highest level of education	4 UG	3 HS	3 HS	2 HS	2 HS	5 HS
	1 PG	8 UG	4 UG	4 UG	2 UG	3 UG
	2 O	1 PG	2 PG	8 PG	3 PG	2 PG
		1 O	1 O			2 O
Ethnicity	6 White, 1 no response	9 White, 4 no response	6 White, 4 no response	9 White; 5 no response	7 White	6 White; 1 British Indian; 5 no response

Abbreviations: DD, developmental dyslexia. Condition: C, control; RT, reduced threat; ST, stereotype threat. Levels of education: HS, high school; O, reported as 'other'; PG, postgraduate; UG, undergraduate, no further details were provided by participants.

imagine that you take this test as a part of a recruitment process for a job that you really want. Please read the following instructions carefully'. Details on the instruction conditions are provided in Table 2.

3.1.2 | Intelligence tests

Intelligence tests were adapted from Graduate Record Examination (GRE; Educational Testing Service, 2002, 2017) and free online Practice Aptitude Tests website (https://www.practiceaptitudetests.com/free-logical-reasoning-test-questions-and-answers/). Questions relating to analytical reasoning and quantitative reasoning were used. Specifically, 13 questions required participants to use their mathematical knowledge, read, understand and solve a problem that involved either an actual or an abstract situation (adapted to work context where possible); these questions tapped into verbal reasoning skills. Two questions required manipulation of coloured geometric designs; these tapped into nonverbal reasoning and cognitive flexibility. The choice of these measures was motivated by their use in similar studies (Ployhart et al., 2003) but also to minimise the risk of participants' familiarity with tests such as those from Wechsler Intelligence Scale (Wechsler, 1997) as they are used in dyslexia assessments. Overall, 15 questions were presented in set order of increasing difficulty. Some questions had multiple choice answers, some were open-ended. Scores were dichotomous (0—incorrect; 1—correct). A total score was calculated.

3.1.3 | Demographics questionnaire

Participants were asked basic demographic information.

3.2 | Procedure

Study was conducted online using Qualtrics. First, participants were presented with the information and consent forms. Participants were randomly assigned to one of the test instruction conditions and presented with the appropriate instructions which were followed by the intelligence tests.

TABLE 2 Details on the instructions used in each condition.

Condition	Manipulation explanation	Instructions
ST—Stereotype threat	Emphasis here is on intelligence and *diagnosticity* of the test; Personal (*you* will find…) Emphasis on high intelligence expectations Based on Ployhart et al. (2003, p. 241) and May and Stone (2010, p. 106)	This test is designed to understand *your intelligence, which means your general quantitative, reasoning skills*. Some questions will seem difficult—this is to allow us to get a real picture of the strengths and *limitations of you as a candidate: you will* find some questions difficult. As a fast-paced organisation, we want to ensure that we have a *high level of intelligence* represented in our staff.
RT—Reduced threat	Focus on problem-solving Less personal (*everybody*) Emphasis on diversity and diverse thinking (in line with research and common understanding that some DDs are more creative). Based on May and Stone (2010, p. 106)	This test is designed to allow us to understand what is *your approach to problem-solving*. Some questions will seem difficult—this is to allow us to get a real picture of the strengths of all *our candidates: everybody* will find some questions difficult. As a diverse organisation, we want to ensure that we have *diverse ways of thinking* represented in our staff.
C—Control	Instructions with neutral background information	'*Please complete the test. The test is difficult*'.

Note: Parts of the instructions were italicised here for explanation purposes; italics were not used in the instructions given to participants.

3.3 | Ethical considerations

The project was conducted in line with the Code of Ethics and Conduct (BPS, 2018) and received ethical approval from a University in central England. Participation was voluntary.

4 | RESULTS

4.1 | Preliminary analyses

Overall, the mean for intelligence tests was 8.92 (SD = 3.27). Participants correctly answered 59% of questions on average rendering the test challenging which is in line with previous research (Spencer et al., 1999). There was no significant gender difference in intelligence scores (males' score = 10.700, SD = 3.233; females = 8.556, SD = 3.279; $t_{(13.440)} = -1.892$; $p = 0.080$).

4.2 | Effects of group and instruction condition on intelligence scores

A 2 × 3 between-subjects ANOVA was carried out to determine the interaction of group (dyslexia vs. no dyslexia) and the type of instructions they were presented with (ST, RT or control) on intelligence test performance. Main effects were also analysed and reported. Visual exploration of boxplots (no outliers or extreme scores) and results from Shapiro–Wilk test of normality (all $p > 0.05$) indicated that the data met ANOVA assumptions of normality. Assumption of equality of variances was also met (Levene's test $p = 0.920$). Descriptive statistics are presented in Table 3.

TABLE 3 Descriptive statistics for intelligence test scores by group and test condition.

	Group		
	Dyslexia	No dyslexia	
Condition	Mean (SD)	Mean (SD)	Condition marginal means
Stereotype threat	5.429 (3.207)	9.929 (3.222)	8.429 (3.815)
	$N = 7$	$N = 14$	$N = 21$
Reduced threat	9.539 (3.230)	6.857 (2.268)	8.600 (3.152)
	$N = 13$	$N = 7$	$N = 20$
Control	10.100 (2.923)	9.333 (2.774)	9.682 (2.801)
	$N = 10$	$N = 12$	$N = 22$
Group marginal means	8.767 (3.556)	9.061 (3.041)	
	$N = 30$	$N = 33$	

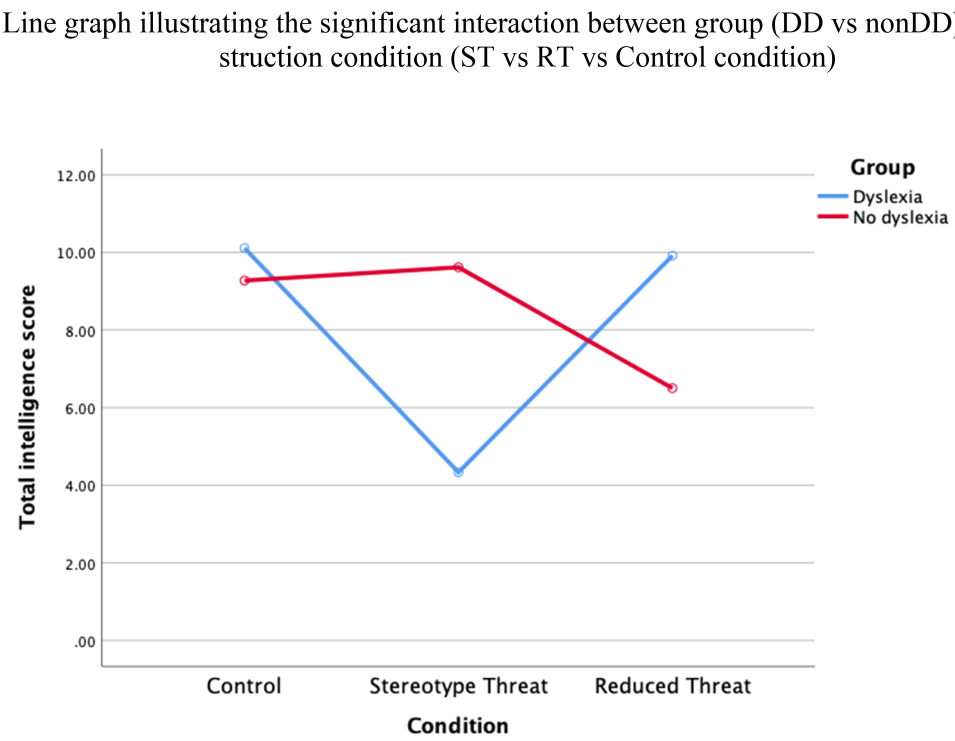

FIGURE 1 Line graph illustrating the significant interaction between group (developmental dyslexia [DD] vs. non-DD) and instruction condition (stereotype threat vs. reduced threat vs. control condition).

There were no significant main effects for group, $F_{(1,57)} = 0.199$, $p = 0.657$ or instruction condition, $F_{(2,57)} = 2.549$, $p = 0.087$. There was a statistically significant group × instruction interaction, $F_{(2,57)} = 7.147$, $p = 0.002$; ηp2 = 0.200 (large effect size) which provides evidence in support of the stated hypothesis (see Figure 1, for graphical presentation of the interaction).

Simple main effect analyses showed that people with dyslexia scored significantly lower on intelligence test than people without dyslexia when they were presented with stereotype threat evoking instructions $F_{(1,57)} = 10.474$;

TABLE 4 Pairwise comparisons showing differences in intelligence scores between dyslexia and no dyslexia participants across three conditions.

	Group					95% Confidence interval for difference	
Condition	*a*	*b*	Mean difference (*a*-*b*)	SE	*p* value[a]	Lower band	Upper band
ST	DD	No DD	−4.500*	1.390	0.002	−7.284	−1.716
RT	DD	No DD	2.681	1.408	0.062	−0.139	5.501
Control	DD	No DD	0.767	1.286	0.553	−1.809	3.342

Abbreviations: DD, developmental dyslexia; RT, Reduced threat; SE, standard error; ST, Stereotype threat.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).
*Mean difference significant at the 0.05 level.

TABLE 5 Pairwise comparisons showing differences in intelligence scores among three instruction conditions across participant groups.

	Condition					95% confidence interval for difference	
Group	*a*	*b*	Mean difference (*a*-*b*)	SE	*p* value[a]	Lower band	Upper band
Dyslexia	ST	RT	−4.110*	1.408	0.005	−6.930	−1.290
	ST	C	−4.671*	1.480	0.003	−7.636	−1.707
	C	RT	0.562	1.263	0.658	−1.968	3.092
No dyslexia	ST	RT	3.071[b]	1.390	0.031	0.287	5.856
	ST	C	0.595	1.182	0.616	−1.771	2.962
	C	RT	2.476	1.429	0.088	−0.385	5.337

Abbreviations: C, control; RT, Reduced threat; SE, standard error; ST, Stereotype threat.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).
[b]Although this *p* value is below 0.05 threshold, univariate test showed no significant difference for this group [$F_{(2,57)} = 2.517$; $p = 0.090$]. As univariate tests account for multiple comparisons the result presented in table is likely to be due Type 1 error therefore it is interpreted as non-significant here.
*Mean difference significant at the 0.05 level.

$p = 0.002$; ηp2 = 0.155 (large). When instructions designed to reduce stereotype threat (RT condition) were used, there were no significant differences between individuals with dyslexia and those without dyslexia $F_{(1,57)} = 3.626$; $p = 0.062$. Control condition showed no significant differences between groups $F_{(1,57)} = 0.355$; $p = 0.553$. Further, there were significant differences in dyslexia group, $F_{(2,57)} = 5.737$; $p = 0.005$; ηp2 = 0.168 (large), where test performance was poorer in ST condition than in RT or control conditions. No significant differences across instruction conditions in the non-dyslexia group were found, $F_{(2,57)} = 2.517$; $p = 0.090$. Pairwise comparisons are presented in Tables 4 and 5.

5 | DISCUSSION

This study investigated if ST effect, previously found in different stereotyped groups, can be extended to individuals with developmental dyslexia. Participants with and without dyslexia were assigned to one of three conditions each offering a different set of instructions to see their performance on stereotype-relevant task (intelligence test). Results provided evidence for the hypothesised interaction between group (dyslexia vs. no dyslexia) and instruction condition (stereotype threat, reduced threat and control) in how they affected the intelligence scores. DD participants who were presented with stereotype threatening instructions performed significantly poorer than those DD

individuals who were shown instructions that were designed to reduce the threat or were included as a control condition (i.e., neutral instructions). When presented with stereotype threat instructions participants with DD performed poorer than those with no dyslexia who were presented with the same instructions. The type of instruction presented to the individuals without dyslexia did not influence their performance which confirms that there was no prevailing stereotype in that group that could have been triggered by appropriately designed instructions. Overall, these results provide preliminary evidence for ST effect in individuals with dyslexia. This needs to be further confirmed with bigger sample.

ST effect typically occurs when the negative stereotype is relevant to the given task (Aronson et al., 1999; Blascovich, et al., 2001; Spencer et al., 1999). The findings here are in line with this assumption. When the task was made relevant by the means of explicitly stating that it is a test for intelligence (stereotype-relevant ability), it became relevant to the group of DD participants who are stereotyped as having low intelligence but not to those who are not negatively stereotyped (individuals without dyslexia). When instructions defined the task as problem-solving focused, so not relevant to the low intelligence stereotype of dyslexia, there was no stereotype threat effect found.

In line with previous research on ST and the mechanisms behind the effect, it is suggested here that the specific instructions that included information about intelligence and a company's desire to recruit those of high intelligence (ST instruction condition) made DD participants aware of their group membership which became relevant to this particular context. In line with previous work this could have made participants more attentive in case there was a potential for discrimination against them (Casad & Merritt, 2014) and increased their sense of threat (Inzlicht, Good, et al., 2006). The ST instructions could have made them more vigilant (Blascovich et al., 2001; Croizet et al., 2004; Murphy et al., 2007). Beyond this, tests were cognitively demanding, and under ST the limited reasoning resources were used up for self-regulating and navigating through the stressful situation rather than on the task at hand (Inzlicht, McKay, et al., 2006; Muraven et al., 1998; Muraven & Baumeister, 2000). The consequence being insufficient recourses remaining to perform to their true ability. Further research is needed to confirm the relevance of the mechanisms that are at play in this specific group of individuals.

Overall, current research contributed to knowledge on potential struggles of people with dyslexia going beyond aspects directly linked with this learning difficulty. Our understanding of what impact low intelligence stereotype may have on DD individuals applying for jobs and completing typical intelligence tests has been extended. These findings, if confirmed, would have important practical implications for individuals with DD as they could be provided with attribution training to alleviate ST effect (Casad & Bryant, 2016; Walton & Cohen, 2007; Wilson et al., 2002) as well as for job selection specialists who should make sure that tests they administer as part of recruitment process should not contain instructions with information that is potentially triggering stereotype threat such as the test will measure one's intelligence. Minimal and neutral instructions should be used.

5.1 | Limitations and directions for further research

It is not certain whether the found decrease in performance of individuals with dyslexia while under stereotype threat would generalise to real-world situations and it would be unethical to replicate the study in real-life high-stakes situations where experimental manipulation may affect individuals' lives and job prospects (Steele et al., 2002). However, the effects of perceived face validity of job selection tests could be explored (Ployhart et al., 2003). Along with this, further research should incorporate IQ measures from age-normed and population-validated test batteries such as Wechsler Adult intelligence Scale or RAVEN'S Standard Progressive Matrices to verify the current results. Further research investigating the effect in larger samples would help to validate the current findings. Research could also investigate mechanisms underlying stereotype threat and explore the extent to which individual differences, such as group identity or domain identification (Osborne, 2001; Steele et al., 2002), affect or

moderate ST effects. Further research looking into how stereotype threat could be reduced would have a potential to help close employment gap between people with dyslexia and those without.

Poorer performance of job candidates has been associated by different factors such as test anxiety, evaluation apprehension, self-doubt, memory, emotion regulation (Kit et al., 2008). In particular, levels of motivation and anxiety have been investigated in the context of racial subgroup underperformance (Ryan & Ployhart, 2000; Ployhart et al., 2003). None of these was included in current research which makes it difficult to conclude that the differences found here are solely due to stereotype threat.

6 | CONCLUSION

The main focus of current research was on stereotype threat, which is the fear of confirming a negative stereotype attached to the group one belongs to or associates with (Schmader, 2010), and its effect on individuals with developmental dyslexia who are often stereotyped as having low intellectual abilities (Lisle, 2011; Lisle & Wade, 2014; Riddick et al., 1999; Riddick, 2000, 2010; Shifrer, 2013). As intelligence tests are often used in selection processes, it was paramount to investigate potential impact of stereotype threat in this group of individuals given previously reported evidence in other stereotyped groups (Hough et al., 2001; Jensen, 1998; Roth et al., 2001; Sackett et al., 2001). Here, a group of individuals with dyslexia and a control group, without any reading difficulties, completed difficult intelligence tests and were asked to imagine that it was part of a recruitment process for a job they really wanted. Those DD individuals who were instructed that the test was diagnostic of their intelligence (ST condition) performed significantly poorer than participants without dyslexia in the same condition and individuals with dyslexia who were informed the test was measuring problem-solving, a skill that is learnable and not relevant to the negative stereotype DDs are subjected to. Current research provides preliminary evidence that people with dyslexia when threatened by stereotype attached to their group may perform suboptimally and if intelligence tests are used as part of job selection process their job prospects may be diminished. This study shed light on one possible barrier of people with DD who are seeking employment. For the first time the effect of ST was investigated and found in dyslexic population.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to all the participants who took part in the study.

FUNDING INFORMATION

This study is part of the first author's (BP) MSc in Occupational Psychology at University of Leicester which was fully funded by Edinburgh Napier University.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in Figshare.

ETHICS STATEMENT

Project was conducted in line with the Code of Ethics and Conduct (BPS, 2018) and received ethical approval from University of Leicester. Participation was voluntary.

ORCID

Barbara Piotrowska https://orcid.org/0000-0002-1098-7246

REFERENCES

Aronson, J., Lustina, M. J., Good, C., Keough, K., Steele, C. M., & Brown, J. (1999). When white men can't do math: Necessary and sufficient factors in stereotype threat. *Journal of Experimental Social Psychology*, *35*(1), 29–46.

Blascovich, J., Mendes, W. B., Hunter, S. B., Lickel, B., & Kowai-Bell, N. (2001). Perceiver threat in social interactions with stigmatized others. *Journal of Personality and Social Psychology*, *80*(2), 253–267.

British Dyslexia Association. (2007). Definitions. http://www.bdadyslexia.org.uk/dyslexic/definitions

British Psychological Society. (2018). Code of ethics and conduct. https://www.bps.org.uk/sites/www.bps.org.uk/files/Policy/Policy%20-%20Files/BPS%20Code%20of%20Ethics%20and%20Conduct%20%28Updated%20July%202018%29.pdf

Casad, B. J., & Bryant, W. J. (2016). Addressing stereotype threat is critical to diversity and inclusion in organizational psychology. *Frontiers in Psychology*, *7*, 8.

Casad, B. J., & Merritt, S. M. (2014). The importance of stereotype threat mechanisms in workplace outcomes. *Industrial and Organisational Psychology*, *7*, 413–419.

Caven, V., & Nachmias, S. (Eds.). (2018). *Hidden inequalities in the workplace: A guide to the current challenges, issues and business solutions*. Palgrave Macmillan.

CIPD. (2020). Resourcing and talent planning survey 2020. Survey report, London CIPD. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjHsuyA-NXyAhWPSsAKHcEtCJAQFnoECAMQAQ&url=https%3A%2F%2Fwww.cipd.co.uk%2FImages%2Fresourcing-and-talent-planning-2020_tcm18-85530.pdf&usg=AOvVaw24WwMHEGcXjrHluD1EddSE

Croizet, J. C., Després, G., Gauzins, M. E., Huguet, P., Leyens, J. P., & Méot, A. (2004). Stereotype threat undermines intellectual performance by triggering a disruptive mental load. *Personality and Social Psychology Bulletin*, *30*(6), 721–731.

De Beer, J., Engels, J., Heerkens, Y., & van der Klink, J. (2014). Factors influencing work participation of adults with developmental dyslexia: A systemic review. *BMC Public Health*, *14*(77), 1–22.

Graduate record examinations (2002). *Practicing to take the general test* (10th ed.). Educational Testing Service.

Gottfredson, L. S. (2002). G: Highly general and highly practical. In R. J. Sternberg & E. L. Grigorenko (Eds.), *The general factor of intelligence: How general is it?* Erlbaum.

Gresky, D. M., Eyck, L. L. T., Lord, C. G., & McIn- tyre, R. B. (2005). Effects of salient multiple identities on women's performance under mathematics stereotype threat. *Sex Roles*, *53*(9), 703–716. https://doi.org/10.1007/s11199-005-7735-2

Gwernan-Jones, R., & Burden, R. (2010). Are they just lazy? Student teachers' attitudes about dyslexia. *Dyslexia*, *16*(1), 66–86.

Hess, T. M., Auman, C., Colcombe, S. J., & Rah-hal, T. A. (2003). The impact of stereotype threat on age differences in memory performance. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *58*(1), 3–11. https://doi.org/10.1093/geronb/58.1.P3

Hong, Y. Y., Chiu, C. Y., Dweck, C. S., Lin, D. M. S., & Wan, W. (1999). Implicit theories, attributions, and coping: A meaning system approach. *Journal of Personality and Social Psychology*, *77*(3), 588–599.

Hornstra, L., Denessen, E., Voeten, M., van den Bergh, L., & Bakker, J. (2010). Teacher attitudes toward dyslexia: Effects on teacher expectations and the academic achievement of students with dyslexia. *Journal of Learning Disabilities*, *43*(6), 515–529.

Hough, L. M., Oswald, F. L., & Ployhart, R. E. (2001). Determinants, detection, and amelioration of adverse impact in personnel selection procedures: Issues, evidence, and lessons learned. *Internal Journal of Selection and Assessment*, *9*, 152–194.

Humphrey, N. (2002). Self-concept and self-esteem in developmental dyslexia: Implications for theory and practice. *Journal of Research in Special Educational Needs*, *2*(2).

Hunter, J. E. (1983). A causal analysis of cognitive ability, job knowledge, job performance, and supervisor ratings. In F. Landy, S. Zedeck, & J. Cleveland (Eds.), *Performance measurement and theory*. Erlbaum.

Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. *Psychological Bulletin*, *96*, 72–98.

International Dyslexia Association (IDA). (2007). *What is dyslexia?* The International Dyslexia Association. http://www.interdys.org/FAQWhatIs.htm

Inzlicht, M., Good, C., Levin, S., & van Laar, C. (2006). How environments can threaten academic performance, self-knowledge, and sense of belonging. In S. Levin & C. van Laar (Eds.), *Stigma and group inequality: Social psychological perspectives*. Psychology Press.

Inzlicht, M., & Kang, S. K. (2010). Stereotype threat spillover: How coping withthreats to social identity affects aggression, eating, decision making, andattention. *Journal of Personality and Social Psychology*, *99*, 467–481.

Inzlicht, M., McKay, L., & Aronson, J. (2006). Stigma as ego depletion how being the target of prejudice affects self-control. *Psychological Science*, *17*, 262–269.

Jensen, A. R. (1998). *The g factor*. Praeger.

Johns, M., Schmader, T., & Martens, A. (2005). Knowing is half the battle: Teaching stereotype threat as a means of improving women's math performance. *Psychological Science*, *16*(3), 175–179.

Kalokerinos, E. K., von Hippel, C., & Zacher, H. (2014). Is stereotype threat a useful construct for organizational psychology research and practice? *Industrial and Organizational Psychology*, *7*(3), 381–402.

Kit, K. A., Tuokko, H. A., & Mateer, C. A. (2008). A review of the stereotype threat literature and its application in a neurological population. *Neuropsychological Review*, *18*, 132–148.

Leitão, S., Dzidic, P., Claessen, M., Gordon, J., Howard, K., Nayton, M., & Boyes, M. E. (2017). Exploring the impact of living with dyslexia: The perspectives of children and their parents. *International Journal of Speech & Language Pathology*, *19*(3), 322–334.

Lisle, K., & Wade, T. J. (2014). Does the presence of a learning disability elicit a stigmatization? *British Journal of Education, Society & Behavioral Science*, *4*(2), 211–225.

Lisle, K. A. (2011). *Identifying the negative stigma associated with having a learning disability*. Honor's theses (pp. 1–56). Bucknell University, Paper 22.

Livingston, E. M., Siegel, L. S., & Ribary, U. (2018). Developmental dyslexia: Emotional impact and consequences. *Australian Journal of Learning Difficulties*, *23*(2), 107–135.

Lockiewicz, M., Bogdanowicz, K. M., & Bogdanowicz, M. (2014). Psychological resources of adults with developmental dyslexia. *Journal of Learning Disabilities*, *47*(6), 543–555.

May, A. L., & Stone, C. (2010). An initial investigation into the role of stereotype threat in the test performance of college students with learning disabilities. *Journal of Postsecondary Education and Disability*, *27*(1), 89–106.

McNulty, M. A. (2003). Dyslexia and the life course. *Journal of Learning Disabilities*, *36*(4), 363–381.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*(2), 247–259.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*(3), 774–789.

Murphy, K. R. (2002). Can conflicting perspectives on the role of g in personnel selection be resolved? *Human Performance*, *15*, 173–186.

Murphy, M. C., Steele, C. M., & Gross, J. J. (2007). Signaling threat: How situational cues affect women in math, science, and engineering settings. *Psychological Science*, *18*(10), 879–885.

Nalavany, B. A., Carawan, L. W., & Rennick, R. A. (2011). Psychosocial experiences associated with confirmed and self-identified dyslexia: A participant-driven concept map of adult perspectives. *Journal of Learning Disabilities*, *44*(1), 63–79.

Nguyen, H. H. D., & Ryan, A. M. (2008). Does stereotype threat affect test performance of minorities and women? A meta-analysis of experimental evidence. *Journal of Applied Psychology*, *93*(6), 1314–1334.

Office for National Statistics. (2016). Respondents aged 16 to 64 broken down by age groups showing employed/unemployed count and rate and duration of unemployment by sex, NS-SEC, ethnicity, highest qualification family types, disabled and whether respondent has a learning difficulty or learning disability. https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/disability/adhocs/006244respondentsaged16to64brokendownbyagegroupsshowingemployedunemployedcountandrateanddurationofunemploymentbysexnssecethnicityhighestqualificationfamilytypesdisabledandwhetherrespondenthasalearningdifficultyorlearningdisabilityjuly2015tojune2015

Official graduate record examinations (2017). In *Quantitative reasoning. Practice questions* (2nd ed.). Edcational Testing Service.

Ones, D. S. (2005). Personality at work: Raising awareness and correcting misconceptions. *Human Performance*, *18*(4), 389–404.

Osborne, J. W. (2001). Testing stereotype threat: Does anxiety explain race and sex differences in achievement? *Contemporary Educational Psychology*, *26*, 291–310.

Pennington, B. F. (2006). From single to multiple deficit models of developmental disorders. *Cognition*, *101*(2), 385–413.

Ployhart, R. A., Ziegert, J. C., & McFarland, L. A. (2003). Understanding racial differences on cognitive ability tests in selection contexts: An integration of stereotype threat and applicant reactions research. *Human Performance*, *16*(3), 231–259.

Ramist, L., Lewis, C., & McCamley-Jenkins, L. (1994). Student group differences in predicting college grades: Sex, language, and ethnic groups. *ETS Research Report Series*, *1994*(1), 1–41.

Ree, M. J., Earles, J. A., & Teachout, M. S. (1994). Predicting job performance: Not much more than g…. *Journal of Applied Psychology*, *79*(4), 518–524.

Reeve, D. (2006). Towards a psychology of disability: The emotional effects of living in a disabling society. In D. Goodley & R. Lawthom (Eds.), *Disability and psychology: Critical introductions and reflections* (pp. 94–107). Palgrave.

Riddick, B. (2000). An examination of the relationship between labeling and stigmatization with special reference to dyslexia. *Disability & Society*, *15*(4), 653–667.

Riddick, B. (2010). *Living with dyslexia* (second ed.). Routledge.

Riddick, B., Sterling, C., Farmer, M., & Morgan, S. (1999). Self-esteem and anxiety in the educational histories of adult dyslexic students. *Dyslexia*, *5*(1), 227–248.

Roth, P. L., Bevier, C. A., Bobko, P., Switzer, F. S., III, & Tyler, P. (2001). Ethnic subgroup differences in cognitive ability in employment and educational settings. A meta-analysis. *Personnel Psychology*, *54*, 297–330.

Ryan, A. M., & Ployhart, R. E. (2000). Applicants' perceptions of selection procedures and decisions: A critical review and agenda for the future. *Journal of Management*, *26*(3), 565–606.
Sackett, P. R., Schmitt, N., Ellingson, J. E., & Kabin, M. B. (2001). High stakes testing in employment, credentialing, and higher education. *American Psychologist*, *56*, 302–318.
Salgado, J. F. (2017). Using ability tests in selection. In H. Goldstein, E. Pulakos, J. Passmore, & C. Semedo (Eds.), *Handbook of the psychology of recruitment, selection, and retention* (pp. 115–150). Malden.
Salgado, J. F., & Anderson, N. (2003). Validity generalization of GMA tests across countries in the European Community. *European Journal of Work and Organizational Psychology*, *12*, 1–17.
Salgado, J. F., Anderson, N., Moscoso, S., Bertua, C., & De Fruyt, F. (2003). International validity generalization of GMA and cognitive abilities: A European Community meta-analysis. *Personnel Psychology*, *56*(3), 573–605.
Salgado, J. F., & Moscoso, S. (2019). Meta-analysis of the validity of general mental ability for five performance criteria: Hunter and Hunter (1984) revisited. *Frontiers in Psychology*, *10*, 2227.
Schmader, T. (2010). Stereotype threat deconstructed. Current directions in psychological. *Science*, *19*, 14–18.
Schmidt, F. L. (2002). *The role of general cogntive ability and job performance: Why there cannot be a debate* (pp. 187–211). Human Performance.
Schmidt, F. L., & Hunter, J. E. (1998). The validity and utility of selection methods in personnel psychology: Practical and theoretical implications of 85 years of research findings. *Psychological Bulletin*, *124*, 262–274.
Shaywitz, S. E., Escobar, M. D., Shaywitz, B. A., Fletcher, J. M., & Makuch, R. (1992). Evidence that dyslexia may represent the lower tail of a normal distribution of reading ability. *New England Journal of Medicine*, *326*(3), 145–150.
Shifrer, D. (2013). Stigma of a label: Educational expectations for high school students labeled with learning disabilities. *Journal of Health and Social Behavior*, *54*(4), 462–480. https://doi.org/10.1177/0022146513503346
Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology*, *35*(1), 4–28.
Steele, C. M. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist*, *52*(6), 613–629. https://doi.org/10.1037/0003-066x.52.6.61
Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, *69*, 797–811.
Steele, C. M., Spencer, S. J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. In M. Zanna (Ed.), *Advances in experimental social psychology* (pp. 379–440). Academic Press.
Stone, J., Lynch, C. I., Sjomeling, M., & Darley, J. M. (1999). Stereotype threat effects on black and white athletic performance. *Journal of Personality and Social Psychology*, *77*(6), 1213–1227.
Stricker, L. J. (1998). *Inquiring about examinee's ethnicity and sex: Effects on AP calculus AB examination performance. (College Board Rep. No. 98–1; ETS Research Rep. No. 98–5)*. College Entrance Examination Board.
Stuebing, K. K., Fletcher, J. M., LeDoux, J. M., Lyon, G. R., Shaywitz, S. E., & Shaywitz, B. A. (2002). Validity of IQ-discrepancy classifications of reading disabilities: A meta-analysis. *American Educational Research Journal*, *39*(2), 469–518.
Tanner, K. (2009). Adult dyslexia and the 'conundrum of failure'. *Disability & Society*, *24*(6), 785–797.
Valencia, R. R., & Suzuki, L. A. (2001). *Intelligence testing and minority students: Foundations, performance factors, and assessment issues. Racial and ethnic minority psychology*. Sage.
Wagner, R. K. (1997). Intelligence, training, and employment. *American Psychologist*, *52*, 1059–1069.
Walton, G. M., & Cohen, G. L. (2007). A question of belonging: Race, social fit, and achievement. *Journal of Personality and Social Psychology*, *92*, 82–96.
Wechsler, D. (1997). *Wechsler adult intelligence scale-third* (UK ed.). Pearson.
Wilson, T. D., Damiani, M., & Shelton, N. (2002). Improving the academic performance of college students with brief attributional interventions. In J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education* (pp. 89–108). Academic Press.
Yeung, N. C. J., & von Hippel, C. (2008). Stereotype threat increases the likelihood that female drivers in a simulator run over jaywalkers. *Accident Analysis and Prevention*, *40*(2), 667–674.

How to cite this article: Piotrowska, B., & Barratt, J. (2024). Investigating low intelligence stereotype threat in adults with developmental dyslexia. *Dyslexia*, *30*(2), e1766. https://doi.org/10.1002/dys.1766