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Growth Mindset

The UK's Department for Education is increasingly looking to apply psychology to assist schools in boosting student achievement. Improving resilience and creating expectations of success are two key focuses outlined in their white paper *Educational Excellence Everywhere* (Department for Education, 2016). Schools are being challenged to promote high expectations for all students and to kindle self-belief and perseverance; they are also being encouraged to reduce the effects of children's personal circumstances e.g., socioeconomic status, on their educational achievement.

'Mindset' has been found to affect an individual's expectations of success, resilience, goals and beliefs about effort (Yeager & Dweck, 2012). Dweck (2006) proposed that people either believe that their personal qualities are static and cannot be changed (fixed mindset), or they believe that their qualities can be developed (growth mindset). Individuals with a 'fixed mindset' endeavour to prove their ability and therefore choose performance goals of achieving a certain standard to demonstrate their intelligence rather than learning goals which aim to enhance their intelligence. They see effort as fruitless and believe that the need for effort demonstrates a lack of ability; thus, they are more likely to abandon challenging tasks (Dweck, 2006) and when they fail, they are likely to attribute this to a lack of intelligence and therefore show low levels of persistence. Focussing on appearing intelligent, rather than increasing intelligence prevents them from accepting criticism, and results in them feeling threatened by others' success. In contrast, individuals with a 'growth mindset' endeavour to improve their knowledge, and therefore embrace challenges by choosing learning goals to increase competence. They value effort and consider it necessary to improve; thus, they are more likely to persist on challenging tasks (Dweck, 2006). When they fail, they are more likely to attribute it to a lack of effort or strategies and therefore show high levels of persistence. They recognise that they can learn from others and from criticism.

In a national dataset of over 168,000 Chilean 10th grade students, Claro, Paunesku and Dweck (2016) found a significant positive correlation between mindset and achievement. Mindset explained 11.8% of the variance in mathematics and language scores, and was a stronger predictor of achievement than the most influential

socioeconomic predictor of mothers' length of education. Students in the lowest 10th percentile of family income who endorsed a growth mindset showed comparable academic performance to fixed mindset students from the 80th income percentile. This demonstrates the influence of mindset on academic achievement, and suggests that it could have a greater effect on academic performance than an individual's socioeconomic status.

Academic Beliefs

Academic resilience is the capacity to overcome adversity that threatens a student's educational development (Martin, 2013). Endorsing a growth mindset and attributing outcomes to effort (a controllable factor) increases expectations of success in learning, which creates a response pattern of resilience in the face of setbacks (Dweck, 2006). In contrast, those with a fixed mindset are more likely to display learned helplessness, i.e., feeling a lack of control over the outcome after attributing failure to their internal, stable attribute of intelligence (Dweck, 1975; Yeager & Walton, 2011).

Academic resilience also contributes to a student's academic self-concept: knowledge and perceptions about their academic ability (Bong & Skaalvik, 2003). Individuals with a growth mindset are more likely to have a positive academic self-concept, and thus engage in self-regulatory strategies, including increased motivation, diligence and concentration (Ommundsen, Haugen & Lund, 2005). In contrast, those with a fixed mindset and thus, poor academic self-concept are more likely to engage in self-handicapping strategies, i.e., withholding effort to preserve the belief that they would have succeeded if they had applied themselves, which prevents potential failure from harming their self-esteem (Ommundsen et al., 2005). Rodriguez (2009) demonstrated that students with positive academic self-concept engage in more complex cognitive processes, such as self-reflection. They also utilise 'deeper' learning strategies to maximise their understanding by focusing on meaning and integrating new learning with previous knowledge; this critical thinking and reflection fosters increased expectations of success and academic achievement (Rodriguez, 2009).

Thus, to increase academic achievement and to create a positive academic self-concept, researchers have applied Dweck's (2006) theory to implement 'growth mindset

interventions' in schools to promote the benefits of endorsing a growth mindset towards intelligence, often targeting disadvantaged, vulnerable or underachieving students (Yeager et al., 2016b).

Applied Interventions

Traditionally, growth mindset interventions have been implemented as workshops. They teach students the basics of neuroplasticity, i.e., the 'science behind the theory', and aim to improve their perceptions of effort and responses to setbacks through influencing processes such as self-talk. Blackwell, Trzesniewski & Dweck's (2007) seminal paper describes a typical workshop intervention, which addressed neuroplasticity, anti-stereotyping and study skills over eight sessions. Students endorsed the growth mindset more strongly after participating in the intervention, and teachers reported increased motivation in lessons. In comparison to a control group who participated in workshops in which the content was not related to mindsets, students in the experimental group also demonstrated significant increases in mathematics performance and reversed declining grade trajectories.

Good, Aronson and Inzlicht (2003) used the growth mindset message to increase achievement for a group facing adversity in mathematics: female, minority, low-income adolescents. University students taught adolescents about neuroplasticity and mentored the adolescents to view their intelligence as malleable. Adolescents' mathematics test scores improved significantly compared to adolescents in a control condition; females made the largest improvement, almost closing the gender gap. This demonstrates the application of the growth mindset message to boost the achievement of vulnerable students.

However, interventions conducted in individual schools can typically only influence a small number of students at a time. Thus, researchers increasingly look to the Internet to scale up their interventions while regulating content (Paunesku, et al., 2015; Yeager et al., 2016a). Online interventions can be cheaper because they may not require an external facilitator to attend the school, and the content can be re-accessed by students, which can aid learning and retention (Andersson & Titov, 2014). For example, Brainology is Dweck and colleagues' flagship program' that explores the

tenets of the mindset theory through four thirty-minute units featuring content and activities. Dweck (2008) reported that Brainology changed students' learning and study habits, encouraging them to become more eager and active learners. Schmidt, Shumow and Kackar-Cam (2017) highlighted that Brainology increased levels of interest in learning and perceived control, and maintained levels of learning and perceived skill.

Educational Practices

Regardless of the method of delivery, programme-based growth mindset interventions only last for a set duration. If the growth mindset message is not sustained, participants' scores can return to baseline in follow-up measures, demonstrating the malleability of students' mindsets (e.g., Orosz, Péter-Szarka, Bóthe, Tóth-Király & Berger, 2017). Yeager and Walton (2011) argue that for intervention effects to be maintained, they should target students' subjective experiences, use subtle methods to express psychological concepts, and interact with recursive processes that already exist in the school environment, e.g., students' beliefs about their ability. As such, some researchers have studied aspects of the school culture that can be adapted to promote the growth mindset message.

DeWitt (2015) argues that it is ineffective to educate students about growth mindsets if teaching practices do not reflect the message. In the classroom, growth mindset practices can include less summative testing and more constructive feedback to increase focus on learning rather than performance. These practices have the added benefit of reducing anxiety in the classroom (DeWitt, 2015; Dockterman & Blackwell, 2014). Dweck also advocates the cultivation of growth mindsets through the curriculum and learning environment, with Brainology being part of the wider project 'Mindset Works' that includes 'MindsetMaker': an online professional development course with tools and resources for teachers to promote a growth mindset culture (Dweck, 2006; Dweck, Walton & Cohen, 2014).

One of Dweck's most widely researched ways of promoting a growth mindset in the classroom is through praising students' application of effort rather than their innate ability. Mueller and Dweck (1998) demonstrated that effort-based 'process' praise, e.g.,

“you must have worked hard at these problems”, fostered increased performance, persistence and enjoyment on a task that students were told they had performed poorly on, while ability-based ‘person’ praise, e.g., “you must be smart at these problems”, increased likelihood of attributing perceived poor performance to low ability and describing intelligence as a fixed trait. Person praise thus creates a ‘helpless’ response to setbacks as viewing failures as a result of low ability decreases expectations of future success and increases likelihood of impaired strategies and performance, as well as negatively impacting self-worth (Kamins & Dweck, 1999).

Another way in which classroom practices can influence students’ mindsets is through task explanation. A year-long study of 1st grade students by Park, Gunderson, Tsukayama, Levine and Beilock (2016) demonstrated that teachers’ self-reported instructional practices significantly predicted students’ mindsets by the end of the academic year. Those who emphasised performance outcomes, e.g., offering rewards to students who performed the best and acknowledging the highest-achieving students, ultimately had more fixed mindset students in the class, even after the students’ original mindsets were controlled for. Performance-oriented instructional practice was also negatively, but not significantly, related to student academic achievement. This could suggest that in the classroom (in contrast to a more controlled experimental setting), teachers’ promotion of a mindset can affect students’ performance in the long-term (Park et al., 2016).

To guide educators in using their language effectively, Dweck and colleagues created task framing and feedback tools with examples of phrases that promote the growth mindset by valuing challenges, effort and mistakes (Mindset Works, 2016a; Mindset Works, 2016b). For example, feedback such as “I expect you to make mistakes when you try hard things! This is challenging, but rewarding!” when framing a task communicates high expectations and highlights acceptance of mistakes (Mindset Works, 2016b, p. 1). However, despite the experimental (e.g., Mueller & Dweck, 1998) and naturalistic (e.g., Park et al., 2016) research, the majority of these interventions have been developed by researchers and delivered in schools and therefore may not take into account important recursive processes and thus not lead to long term changes in classrooms.

Co-creation

It is important to understand the individual context of each school, which is influenced by factors such as the school's internal organisation, pupil intake characteristics, and school and area characteristics (Thrupp & Lupton, 2006). Interventions conducted on large populations, particularly online interventions, do not typically consider specific school context (Paunesku et al., 2015). Although large-scale implementation of interventions may not allow for the consideration of context, it is argued that the most beneficial interventions will modify materials and procedures to most effectively target a specific population and/or context (Yeager & Walton, 2011).

One way to ensure that an intervention is appropriate for a school context is for school staff to have input in its design. Co-creation with stakeholders can highlight practical issues prior to implementation, which can maximise adoption of the programme; it can also facilitate ownership of the programme for recipients (Denford et al., 2016). However, co-creation also creates challenges, such as building relationships, co-operation and communication, due to diverse backgrounds and viewpoints (Yang & Sung, 2016). Thus, few interventions, including those promoting a growth mindset, utilise co-creation. The current study uses a co-creation approach to harness its benefits with a view to increase efficacy of the intervention.

Students with SEND

Many growth mindset interventions target vulnerable children and young people as a means of reducing the achievement gap (Yeager et al., 2016b). However, one vulnerable population that is neglected in mindsets research is students with Special Educational Needs and/or Disabilities (SEND). Despite a range of interventions promoting a growth mindset, students with SEND are rarely the intended participants. In fact, they are sometimes disregarded: in Claro et al.'s (2016) nationwide study, data from those with learning disabilities was discarded, possibly because their attainments were not comparable to their neurotypical peers, which could have skewed results. Academic achievement for those with SEND is particularly poor: in 2017, only 12.8% of pupils in England with SEND attained a Grade 5 or above in English and Mathematics

(GCSE or equivalent), compared to 47.6% of all other pupils (Department for Education, 2018b).

It is disappointing that students with SEND have been overlooked for growth mindset interventions because research has suggested that they are more likely to have a fixed mindset than their peers: Baird, Scott, Dearing and Hamill (2009) concluded that students with SEND were more likely to prefer performance goals over learning goals and interpret needing to use increased effort to compensate for a lack of innate ability. Students with SEND also typically show lower academic self-efficacy and academic self-concept, and demonstrate less persistence in schoolwork in comparison to their peers (Ayres, Cooley & Dunn, 1990; Baird et al., 2009). In failure situations, they are more likely to attribute their poor performance to their intelligence instead of more controllable factors, such as effort (Ayres et al., 1990). This indicates potential benefits of promoting a growth mindset to children and young people with SEND.

An additional challenge that students with SEND can face is negative attitudes related to their additional needs. Kordoutis, Kolaitis, Perakis, Papanikolopoulou and Tsiantis (1995) highlighted stereotyped attitudes (over-generalised and simplified perceptions about a minority group) as common towards individuals with learning disabilities. May and Stone (2010) also found that students with and without learning disabilities reported many stereotypes about those with SEND at comparable frequencies, such as a perception of 'working the system'—that those with learning disabilities are lazy, lying or taking advantage of benefits for feigned disabilities. However, compared to those without learning disabilities, a greater proportion of students with learning disabilities reported a perception of having 'low intelligence' (May & Stone, 2010). This demonstrates that negative attitudes towards disability are held by the general population and those in the SEND population.

A possible benefit of endorsing a growth mindset for students with SEND is its ameliorating effect on stereotype threat, i.e., the risk of conforming to a negative stereotype about one's social group that can result in disengagement, self-handicapping and decreased academic performance (Steele & Aronson, 1995). Aronson, Fried and Good (2002) implemented a growth mindset intervention and found that it buffered African American university students' responses to the stereotype threat of black

students possessing inferior ability to other ethnic groups. Participants were asked to write letters to younger pen pals advocating a growth mindset, which led participants themselves to develop more of a growth mindset and to be more resilient to stereotype threat. This narrowed the achievement gap between African American and White American students in the class, as well as improving self-reported value and enjoyment of their courses.

Those with SEND are susceptible to stereotype threat: Silverman and Cohen (2014) found that individuals with a physical disability were affected by an 'incompetence' stereotype, which prevented them from engaging in challenging or evaluative situations, e.g., a job interview. Higher levels of stereotype threat were also related to lower self-integrity and wellbeing (Silverman & Cohen, 2014). This demonstrates how those with SEND can be affected by negative stereotyped attitudes surrounding disability.

Thus, students with SEND could potentially benefit from a growth mindset intervention to a greater degree than their peers due to their tendency towards a fixed mindset and associated traits of lower academic self-concept and academic resilience, as well as susceptibility to negative stereotyped attitudes surrounding disability.

The Present Study

The present study implemented a ten-week growth mindset intervention for students with SEND. Students participated in a workshop programme embedded into their Personal, Social and Health Education (PSHE) curriculum. The psychological content was delivered online and was supported with classroom activities and discussion to reinforce the growth mindset message. The programme was co-created with school staff, to ensure that it was suitable for the students and school.

To contextualise the content outside of the lessons and target existing recursive processes, the students' learning culture was also changed by implementing strategies that promoted a growth mindset into their English lessons. This involved adapting lesson objectives to reflect learning rather than performance goals, framing tasks to encourage the use of effort and providing feedback that praised the application of effort.

The adaptations were based on examples from Dweck's feedback and framing tools (Mindset Works, 2016a; Mindset Works, 2016b).

It was hypothesised that the intervention would increase the endorsement of the growth mindset in young people with SEND. It was also hypothesised that the intervention would improve students' academic self-concept and academic resilience, attitudes towards disability and academic performance, and that these improvements would be a result of the increased endorsement of the growth mindset.

Method

Participants

Participants were eighteen pupils (nine males) aged between fourteen and sixteen years old ($M = 14.9$, $SD = 0.9$) who attended a secondary special school for children and young people with SEND.

Design

This quasi-experimental intervention employed a single-group interrupted time series design. In this, a single condition is under study, i.e., there is no control group; dependent variables are ordered as a time series and the intervention 'interrupts' the trend of the time series (Linden, 2017). It was decided that including a control group was not appropriate due to the specificity of participants' additional needs, and thus, difficulty of comprising a subsample that was comparable in these characteristics. The study utilised pre-, post-, and delayed post-test measures to assess the effect of the intervention, and any change in mindset, on academic resilience, academic self-concept, attitudes to disability and academic performance. It also used prior student achievement as a retrospective control measure for academic performance to assess progress in the previous term as a comparison for academic progress during the intervention.

Procedure

Co-creation. Co-creation was utilised in the design of the intervention to ensure that it was tailored to the participants and setting. The school's principal, clinical

psychologist and a teacher were involved in the design of the PSHE lessons along with the authors. The principal and psychologist highlighted topics within the growth mindset domain that they wished to be covered in the course, and had a particular interest in increasing academic resilience. The researchers then created a draft of the intervention. The psychologist and teacher suggested adaptations to ensure that activities were appropriate for the full range of abilities in the classes. Finally, the principal endorsed the intervention in the information sheet sent to parents to maximise participation in the measures.

PSHE lessons. Participants completed ten fifty-minute once a week PSHE lessons. These were loosely based on Blackwell et al.'s (2007) workshops yet were adapted into the structure of a lesson to integrate it into the PSHE curriculum, with the content tying in with the Department for Education's (2018a) promotion of good mental health and emotional wellbeing. Each lesson covered a different aspect of growth mindset; some were central to the theory (e.g., the power of effort), while others were closely related (e.g., anti-stereotyping) to add context and deepen understanding for participants.

The lessons followed the same structure each week, based on Paunesku et al.'s (2015) online unit and classroom activity structure. A warm-up game, taken from Mosley and Sonnet (2006), was used to build group cohesion and prepare participants for class discussion. The psychological content of the lesson was delivered on computers via LearnDash, an online management system. Participants read a piece of text explaining the key concept in the lesson and then completed a multiple choice and short answer quiz as a manipulation check to ensure that they understood the content. This lasted for approximately twenty minutes. As an example, the first lesson, which teaches neuroplasticity, was based on Mindset Works' (2016c) 'growing intelligence' news article. This was followed by an activity and class discussion related to the focus of the lesson, which encouraged students to reflect on the concept in relation to their academic experiences, and helped to make abstract concepts more concrete (as in Orosz et al., 2017). This lasted for approximately thirty minutes. For example, in the changing self-talk lesson, participants brainstormed their own negative self-talk phrases

that they use when faced with a challenge or setback and how these could be changed to positive self-talk through endorsing a growth mindset.

Classroom intervention. To contextualise the content that the students were learning in their PSHE lessons, strategies that promoted a growth mindset culture were also implemented in the students' English lessons. This involved rewording the lessons' learning objectives to reflect learning goals, which aim to deepen understanding, instead of performance goals, which are linked to outcomes currently demonstrated in the National Curriculum. For example, 'use paragraphs in writing' became 'understand when, how and why to use paragraphs in writing'. The teacher and support staff framed tasks in a way to promote hard work and effort, using examples from Mindset Works' (2016b) Framing Tool. They also provided verbal and written feedback on work that praised students' application of effort instead of innate intelligence, based on examples from Mindset Works' (2016a) Feedback Tool. Manipulation of teaching practices was introduced in a short training for staff and overseen in lessons by a researcher. A poster based on the students' ideas from the self-talk lesson was displayed outside the classroom to further promote the growth mindset culture in the school environment.

Measures

To assess the impact of the intervention on participants' mindsets, academic resilience and self-concept, attitudes towards disability, and academic achievement, a pre-post design was utilised. The following measures were completed immediately pre- and post-intervention, as well as seven weeks after the conclusion of the intervention to assess the maintenance of any effects of the intervention (delayed post-intervention).

Mindset. The short version of Dweck's (1999) Implicit Theories of Intelligence Scale for Children measured the 'growth' of participants' mindsets. Three items (e.g., "You have a certain amount of intelligence and you can't really do much to change it") were assessed on a 1 (*Strongly Disagree*) to 4 (*Strongly Agree*) Likert-type scale. The original scale was 1 to 6, but due to the additional needs of the young people, it was appropriate to simplify the measures by reducing the number of gradients to four points (Hartley & MacLean, 2006).

Academic resilience. Martin and Marsh's (2006) Academic Resilience Scale measured the participants' resilience in the context of education. Six items (e.g., "I think I'm good at dealing with schoolwork pressures") were assessed on a 1 (*Strongly Disagree*) to 4 (*Strongly Agree*) Likert-type scale. As above, the original scale was 1 to 7, but this was reduced to four points.

Academic self-concept. Three subscales were chosen from Boersma and Chapman's (1992) Perception of Ability Scale for Students to measure academic self-concept: perception of general ability, school satisfaction and confidence in academic ability. 34 items (e.g., "I have difficulty doing what my teacher says") were assessed using binary *Yes/No* responses.

Attitudes to disability. Williams, Best, Boswell, Mattson and Graves' (1975) Preschool Racial Attitudes Measure II was adapted to measure attitudes towards disability. On a screen, participants were presented with two similar people, one with a disability and one without, and an accompanying question (e.g., "Which is the nice woman?"). Scores for positive and negative attitudes to disability were calculated based on two points for each trait attributed to the person with a disability, one point for each trait attributed to both persons, minus one point for each trait attributed to neither person, and minus two points for each trait attributed to the person without a disability. Larger scores (positive or negative) revealed stronger attitudes towards disability, while smaller scores revealed neutral attitudes.

Academic performance. Participants' half-termly reading paper examination scores were used as a measure of academic performance in English lessons: the subject that applied growth mindset adaptations. This measure was also assessed retrospectively (eleven weeks pre-intervention) to act as a retrospective control group.

Ethical Considerations

Information sheets were sent to parents detailing the intervention, accompanied by opt-out consent forms. Opt-out parental consent was chosen because the school's principal had given consent for the students to participate, and the intervention was comprised of activities normally undertaken at school. Thus, parents were informed that they could prevent their children from participating in the research measures but not the

main intervention. Students also gave verbal assent before each data collection session, and were reminded that the measures were being used to evaluate the intervention and not individual students. In case reflection upon disability caused upset for individuals, during the lessons, participants were verbally advised to talk to a teacher or the school's clinical psychologist; contact details for Scope (a disability charity) were also provided in the debrief.

Results

The data was analysed using JASP (JASP Team, 2018), with Lee and Wagenmakers' (2013) Bayes factor categorical descriptors.

Mindset

Bayesian paired samples t-tests revealed no evidence for students' mindsets becoming more growth from the pre- ($M = 7.47$, $SD = 2.27$) to delayed post-test ($M = 6.78$, $SD = 2.13$) ($BF_{+0} = .699$) but moderate evidence for increased endorsement of the growth mindset from pre- to immediate post-test ($M = 6.00$, $SD = 1.68$) ($BF_{+0} = 4.713$). This suggests that the intervention increased endorsement of the growth mindset for its duration, but the effect was not maintained.

Academic Resilience and Academic Self-Concept

Bayesian paired samples t-tests revealed anecdotal evidence for students' academic resilience increasing from the pre- ($M = 15.32$, $SD = 4.14$) to delayed post-test ($M = 16.56$, $SD = 3.73$) ($BF_{-0} = 1.315$), including anecdotal evidence for students' academic resilience increasing from pre- to immediate post-test ($M = 16.47$, $SD = 4.79$) ($BF_{-0} = 2.204$) and moderate evidence for no further increase in academic resilience from immediate post- to delayed post-test ($BF_{0-} = 3.832$). A Bayesian repeated measures ANCOVA from pre- to immediate post-test demonstrated no evidence that change in mindset affected academic resilience ($BF_{10} = .752$). This suggests that the potential increase in academic resilience was related to the intervention itself rather than indirectly through a change in mindset.

Bayesian paired samples t-tests revealed anecdotal evidence for students' academic self-concept increasing from the pre- ($M = 15.74$, $SD = 5.13$) to delayed post-test ($M = 16.92$, $SD = 6.19$) ($BF_{-0} = 1.045$), including anecdotal evidence for students' academic self-concept increasing from pre- to immediate post-test ($M = 18.08$, $SD = 7.48$) ($BF_{-0} = 1.779$) and moderate evidence for no further increase in academic self-concept from immediate post- to delayed post-test ($BF_{0-} = 7.887$). A Bayesian repeated measures ANCOVA from pre- to immediate post-test demonstrated no evidence that change in mindset affected academic self-concept ($BF_{10} = .688$). This suggests that the potential increase in academic self-concept was related to the intervention rather than indirectly through a change in mindset.

Attitudes to Disability

Bayesian paired samples t-tests revealed no evidence for students' positive attitudes increasing from the pre- ($M = 3.53$, $SD = 5.27$) to delayed post-test ($M = 3.71$, $SD = 4.03$) ($BF_{-0} = .276$) but anecdotal evidence for positive attitudes increasing during the intervention, from pre- to immediate post-test ($M = 5.77$, $SD = 2.71$) ($BF_{-0} = 1.913$). Bayesian paired samples t-tests revealed no evidence for students' negative attitudes decreasing from the pre- ($M = -1.82$, $SD = 3.88$) to delayed post-test ($M = -1.00$, $SD = 5.97$) ($BF_{-0} = .403$). This suggests that only positive attitudes towards disability were influenced by the intervention, but this effect was not sustained.

Academic Performance

Bayesian paired samples t-tests revealed stronger evidence for students making progress in the eleven weeks pre-intervention ($M = 15.25$, $SD = 3.56$) to immediate pre-intervention ($M = 17.49$, $SD = 4.29$) ($BF_{-0} = 4630.383$), than during the seventeen weeks of and after the intervention, from immediate pre-intervention to delayed post-intervention ($M = 18.22$, $SD = 4.63$) ($BF_{-0} = 132.282$).

A Bayesian repeated measures ANCOVA revealed strong evidence for change in mindset affecting academic performance during the intervention, from immediate pre-intervention ($M = 17.60$, $SD = 4.40$) to immediate post-intervention ($M = 18.10$, $SD = 4.57$) ($BF_{10} = 22.525$). However, assessing the direction of the covariate, a correlation

plot revealed a negative correlation, with those experiencing the greater changes in mindset making less progress in academic performance, $r(15) = -.54$, and no evidence for endorsement of the growth mindset increasing academic performance ($BF_{+0} = .105$). Conversion to z-scores indicates that every 1 SD increase in endorsement of the growth mindset is related to a .55 SD decrease in academic performance. This suggests that the intervention did not accelerate students' academic progress, and that endorsing a growth mindset was associated with making less academic progress during the intervention.

Discussion

Interpretation of Findings

Results suggested moderate evidence for the intervention increasing students' endorsement of the growth mindset, but this effect was not maintained after the cessation of the intervention. Results demonstrated anecdotal evidence that the intervention increased students' academic resilience and academic self-concept, but these effects were not maintained nor related to change in mindset. Results suggested that the intervention did not decrease negative attitudes towards disability, but demonstrated anecdotal evidence for increasing positive attitudes. Results demonstrated that the intervention did not improve students' academic progress in comparison to the previous term, and that greater change towards a growth mindset was related to less progress.

Like many previous growth mindset interventions, students demonstrated a shift towards the growth mindset (e.g., Blackwell et al., 2007). Considering many growth mindset interventions target 'at risk' students (e.g., Good et al., 2003), this suggests that students with SEND are a viable target for such interventions. These positive findings also demonstrate the efficacy of using an online program to deliver a growth mindset intervention, supporting Dweck's Brainology (e.g., Dweck, 2008). This is particularly promising for students with SEND who benefit from assistive technologies in the classroom (Bryant, Bryant & Ok, 2014).

The intervention may have improved students' academic resilience and academic self-concept. For academic resilience, this suggests that students may have been

better able to manage stressors (Morales, 2008). For academic self-concept, this suggests that students may have been more likely to use deeper learning strategies and engage in more complex cognitive efforts (Rodriguez, 2009).

With regards to attitudes to disability, although there was anecdotal evidence for students' positive attitudes increasing, congruent with May and Stone (2010), the students retained negative attitudes. This suggests that the intervention did not decrease the young people's susceptibility to stereotype threat, which is a beneficial outcome that could have been expected based on Aronson et al.'s (2002) conclusions. This could be because the intervention was intended to be inherently positive, so did not explicitly discuss negative stereotypes surrounding disability. Alternatively, this could be because, in line with the negativity bias in which negative stimuli elicit stronger reactions than comparable positive stimuli, the negative stereotypes were more ingrained and thus harder to change (Griffin & Langlois, 2006). Further research is therefore needed in this area to explore the link between mindsets and stereotype threat.

The modular structure of the PSHE programme might account for the effects of the intervention being unrelated to change in mindset. Each lesson targeted a different aspect of the growth mindset: the course began with the underlying science of neuroplasticity before considering related, but not essential, concepts to the growth mindset, such as understanding feedback from teachers. These later lessons aimed to reinforce the growth mindset message and had aspects of the theory woven into them. Resilience and stereotyping were each the main topic of a lesson; thus, it is possible that academic resilience, academic self-concept and positive attitudes to disability increased as a direct result of these lessons in the intervention, rather than the underlying growth mindset message and increase in growth mindset endorsement. It could also suggest that elements of the growth mindset, e.g., resilience, resistance to stereotype threat, are not as closely related to mindset endorsement as might be expected.

The slower academic progress in comparison to the previous term could be expected. A research report by the Department for Education (2011) revealed that the more progress a student makes in the previous term, the less likely they are to make progress in the following term. Thus, the use of a retrospective control group for

academic performance might have been misleading. The relationship between increased change in mindset and slower academic progress was unexpected. A possible explanation for this is because the growth mindset emphasises the importance of deeper learning and mastery goals and draws the focus away from reaching performance goals, such as examination scores. Perhaps the students who most increased their endorsement of the growth mindset were initially focusing more on deepening their learning and understanding, and less on performance. Blackwell et al. (2007) reported that changes in mindset did not immediately result in significant increases in mathematics performance, but that those who endorsed a growth mindset gradually increased in ability over a two-year period. This suggests that to document the effect of change in mindset on academic performance, follow-up measures should be conducted long after the conclusion of the intervention.

Finally, it is perhaps not surprising that the effects of the intervention were not maintained following the cessation of sessions and removal of growth mindset promoting classroom practices, and is reflective of findings from previous growth mindset interventions (Schmidt et al., 2017). For example, the decreased demotivation induced in Orosz et al.'s (2017) was not sustained two-months post-intervention. Thus, mindset beliefs appear to be very malleable: they change quickly during an intervention but can quickly return to their initial level in the absence of the growth mindset message (Dommett, Devonshire, Sewter & Greenfield, 2013). This emphasises the need for embedding the growth mindset culture within existing recursive processes in the classroom and school environment (Yeager & Walton, 2011). A combination approach is likely to be beneficial, with maintained growth mindset practices in the classroom and PSHE workshops spread throughout the academic year. With this, students could reap cumulative and maintained outcomes.

Limitations

A control group was not utilised because of the specificity of the young people's abilities and needs, and thus, difficulty of comprising a comparable subsample. However, because of the lack of equivalent control group, it is not possible to isolate the effects of the intervention from the influence of confounding factors, such as other

concurrent interventions that the students were receiving, e.g., anxiety workshops, literacy skills groups (Pithon, 2013). This is the biggest threat to validity for studies employing a single-group interrupted time-series design (Linden, 2017).

Due to the small size of the sample, all participants took part in the PSHE programme and experienced the change in classroom culture. Thus, the relative effectiveness of each component is undetermined (Hulleman & Barron, 2015). It is rational to assume that conducting components in parallel had a cumulative effect for the students but a between-groups design would be necessary to compare efficacy.

Although the intervention was co-created with school staff, which ensured that it was appropriate for the students in terms of activities and resources, there was no measure or assessment of the current practices that the school (perhaps unknowingly) already use to promote the growth mindset message. This is a common issue in growth mindset interventions, e.g., Orosz et al. (2017). For example, teachers may already use phrases similar to those in Dweck's feedback and framing tools (Mindset Works, 2016a; Mindset Works, 2016b). In the pre-intervention measures, although the average mindset was slightly more fixed, it was very much in the middle of the scale, which could have reduced the margin for change for the current intervention.

Rattan, Savani, Chugh and Dweck (2015) recommend that schools should endeavour to empirically evaluate interventions to expand the current evidence base, but an objective measure of existing growth mindset practices in the classroom would be necessary for this. Future research should endeavour to create reliable and valid measures of a variety of growth mindset practices in the classroom. As mentioned in the introduction, very little research currently exists in this area so objective evaluation would be important. The measure could be used to document how educators in the UK are currently implementing the growth mindset message into their learning environments.

Implications

The present study demonstrated the feasibility of a two-component growth mindset intervention for students with SEND. However, the lack of long-term effects demonstrates the need for a sustained growth mindset message to ensure that students

reap lasting benefits. Thus, instead of implementing finite interventions, it is more sustainable to spread out growth mindset workshops throughout the academic year and review the learning environment to ensure that it is promoting the growth mindset message.

Rattan et al. (2015) suggest that, for example, educators could consider whether their grading practices capture 'process' as well as performance, while policymakers can reinforce this by implementing grading practices that reward challenge seeking, perseverance and ongoing improvement. Yeager and Walton (2011) emphasise that such approaches are effective because they target the child's subjective experiences of school, use covert methods to promote the growth mindset, and ultimately create self-reinforcing processes for the child.

However, Yeager, Walton and Cohen (2013) insist that while psychological interventions can encourage students to become more independent learners, they cannot replace educational reforms in solving national issues throughout the educational system. For example, Skipper and Douglas (2016) found that the mere existence of the eleven plus exam, which is used to stream children into different schools based on ability, is enough to create more of a fixed mindset in children in this system. Encouragingly, however, the Department for Education have recently introduced the measure 'Progress 8' to capture the progress a student makes from the end of primary to the end of secondary school (Department for Education, 2018c). This encourages schools to assess each pupil as an individual to facilitate progress, and detract the focus from their cohort achieving a performance marker, e.g., Grade 5 at GCSE or equivalent.

Overall, although findings from the present study should be considered preliminary due to limitations, they highlight that students with SEND could benefit from growth mindset interventions. This is encouraging as they are a group of students who are at risk of a fixed mindset and low academic achievement (Baird et al., 2009; Department for Education, 2018b). There is tentative evidence that the intervention increased endorsement of a growth mindset, increased academic resilience and self-concept, and improved positive attitudes to disability. However, to have a lasting impact

and influence academic achievement, the growth mindset message needs to be sustained in the learning environment (Yeager & Walton, 2011). This can be maximised and reinforced through adapting educational policy (Yeager et al., 2013). While the Department for Education are increasing their promotion of the psychology of education, there is still much work to be done in applying growth mindset research. In this, it is important to keep a focus on vulnerable students, including a group who could stand to benefit the most: children and young people with SEND.

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