



**Exploring the Relationship Between Self-Theories of Intelligence and
Test Anxiety: The Impact of a Brief Intervention Aiming to Promote an
Incremental View of Intelligence.**

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Doctorate in Educational Psychology (DEdPsy)

2017

Abstract

In the United Kingdom (UK) there is an increasing focus on children's performance in tests with many children experiencing test anxiety due to the academic pressure arising from the rigorous testing culture (Putwain, 2008). The current research aimed to investigate whether a brief intervention promoting an incremental view of intelligence could shift sixth-form pupils' self-theories of intelligence (STOI) and reduce their levels of test anxiety. Data was collected from three UK secondary schools using a mixed methods approach. Findings indicate that a brief STOI intervention can lead to statistically significant shifts towards a more incremental perspective however, these changes were not sustained at a three-month follow-up. Furthermore, promoting an incremental perspective does not seem to have a statistically significant impact in reducing pupils' levels of test anxiety. Consequently, interventions aiming to promote an incremental theory of intelligence might not offer a solution to reducing pupils' levels of test anxiety. However, as research highlights that holding an incremental perspective has a range of benefits, educational psychologists (EPs) could offer a valuable contribution by providing similar interventions in schools. Further research is needed to explore how a shift to an incremental perspective can be maintained.

Summary

This thesis is split into three parts: a literature review, an empirical study, and a critical appraisal. Part 1 provides a thorough review of the existing literature on test anxiety and self-theories of intelligence (SToI). The review is split into four sections: introduction, test anxiety, SToI and rationale. It begins by defining the test anxiety construct and the different ways this can be conceptualised before exploring the impact of test anxiety. Existing research on strategies to support the reduction of test anxiety is summarised and critiqued. Links between test anxiety and SToI are considered before moving on to discuss SToI. SToI are defined as well as exploring existing research on the relationships between SToI and other behaviours. Interventions aiming to promote an incremental view of intelligence are discussed and critiqued. Finally, gaps in the existing research are summarised and subsequent research questions and hypotheses are proposed.

Part 2 is an account of the empirical study, which aimed to explore whether a brief intervention promoting an incremental view of intelligence could shift sixth-form pupils' SToI and reduce their levels of test anxiety. The section includes a brief review of the existing literature to outline the rationale and research questions. A detailed methodology is provided, including information on the research design and ethical considerations. Quantitative and qualitative findings are discussed in relation to current thinking as well as highlighting areas for future research and the practical implications for the role of educational psychologists (EPs).

Finally, part 3 is a critical appraisal of the research process and the researcher's own professional development. It is split into two sections, exploring both the contribution to knowledge and a critical account of the research practitioner. It provides a reflective account of the decisions made throughout the research process in addition to the philosophical underpinnings.

Acknowledgements

Firstly, I would like to thank the pupils, teachers and schools who kindly took the time to participate in my research, your enthusiasm to volunteer made this whole process significantly less stressful!

Thank you to all my friends and family for their continuous support and encouragement, without you I almost certainly would not have got this far! In particular, I would like to give a special thank you to my mum for all of her proofreading support over the years.

I would like to extend my gratitude to Andrea Higgins for her guidance and support throughout the whole thesis process. I would also like to thank Ian Smillie whose support has been invaluable throughout the last three years.

I have been fortunate enough to have three wonderfully supportive placements with the opportunity to work alongside some incredible placement supervisors and educational psychology teams. Thank you for everything you have taught me, I have learnt so much from you all that I will take forward with me in my professional career.

Finally, thank you to all of the DEdPsy girls for providing support, reassurance and celebration of all the milestones along the way! I have been incredibly fortunate to start the course with ten other people who have become some of my closest friends.

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List of abbreviations

A-Level	General Certificate of Education Advanced Level
ANOVA	Analysis of variance
BBC	British Broadcasting Corporation
COMOIRA	Constructionist Model of Informed and Reasoned Action
DoH	Department of Health
EP	Educational psychologist
EPS	Educational psychology service
GCE	General Certificate of Education
GCSE	General Certificate of Secondary Education
H ₀	Null hypothesis
NHS	National Health Service
NSPCC	National Society for the Prevention of Cruelty to Children
NUT	National Union of Teachers
OFSTED	Office for Standards in Education
SPSS	Statistical Package for Social Sciences
SToI	Self-theories of intelligence
TEP	Trainee educational psychologist
UK	United Kingdom
USA	United States of America

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Part 1: Major Literature Review

1. Introduction

One in ten children in the United Kingdom (UK) experience mental health problems, with anxiety currently being one of the most common difficulties (Department of Health (DoH), 2015). Separation from a loved one, a fear or phobia, social situations and school-based anxiety, which can include anxiety about friendships, bullying and schoolwork, all act as key determinants for increased levels of anxiety in childhood (National Health Service (NHS), 2014). The academic pressure arising from the rigorous testing culture within UK schools is highlighted as being especially problematic to children's mental health (Weale, 2016).

Within the UK, there is an increasing focus on children's performance in tests (Putwain, 2008b). Some pupils can find the pressure of testing difficult, with test anxiety affecting many children (Owen-Yeates, 2005; Robinson, Alexander & Gradisar, 2009). Elevated levels of test anxiety have been associated with lower test performance (Putwain, 2008d; McDonald, 2001), emphasising the potential for test anxiety to have a significant impact on academic outcomes; a particularly pertinent issue when so much importance is often placed on test results (Von Der Embse & Witmer, 2014).

Although test anxiety is a problem for many pupils, it seems that there is very little research exploring supportive strategies (Von Der Embse, Barterian & Segool, 2013). It is the role of all professionals who work with children to ensure that they receive appropriate support in managing any mental health difficulties, including test anxiety (DoH, 2015). Consequently, it is important for educational professionals, including educational psychologists (EPs), to find ways to support pupils in managing their test anxiety to enable them to reach their academic potential and promote positive mental wellbeing.

Research exploring test anxiety has often focused on cognitive influences. For example, a fear of failure, concerns that tests might indicate low ability and how they might be perceived by others appear to be central components in the development of test anxiety (Denscombe, 2000; Putwain, 2009b). Many of these cognitive factors fit within what can be described as an entity theory of intelligence (Dweck, 1999). Research has suggested that shifting an individuals' beliefs towards a more

incremental view, where intelligence is seen as a malleable quality that can grow and develop, can have benefits for effort, motivation and achievement (Blackwell, Trzesniewski & Dweck, 2007; Grant & Dweck, 2003). Furthermore, research with stereotyped groups, including female, minority and low-income students, indicates that promoting an incremental view can reduce levels of test anxiety (Aronson, Fried & Good, 2002; Good, Aronson & Inzlicht, 2003). The current study aims to add to the existing literature by exploring whether an intervention which aims to promote an incremental view of intelligence can shift sixth-form pupils' self-theories of intelligence (SToI) and reduce levels of test anxiety.

1.1. Overview of the literature review

The literature review begins by providing a definition of test anxiety and an exploration of the aetiology of the construct. It considers ways that test anxiety can be measured as well as its impact, including the child's view. Strategies to reduce test anxiety are discussed before focusing specifically on cognitive strategies. The topic of SToI is introduced, with a summary of the links between test anxiety and the dichotomies of SToI. A definition is provided and ways to measure the different types of SToI are explored. Research on the links between SToI and other behaviours are critically discussed and possible interventions are examined. The review concludes with a rationale for the current research, its relevance to EPs and the research questions and hypotheses.

1.2. Search terms and sources

Electronic resources used to source relevant research for the literature review included: PsycINFO (1806-2016), British Education Index (EBSCO) and Google Scholar. Search terms were: 'test anxiety', 'exam stress', 'self-theories', 'intelligence', 'Dweck', 'education' and 'school' (appendix 20). The use of subject searching meant that a variety of related terms were considered under each search term. For example, 'test anxiety' included terms such as: 'exam stress', 'exam anxiety' and 'evaluation anxiety'. Search terms were truncated to increase the number of results and further expanded through combining terms and considering whether terminology or spellings might be

different in American English. Some references in relevant articles were also explored further and general media searches were conducted. Other sources included key books and documents about test anxiety and self-theories. Literature searches were conducted between December 2015 and December 2016 however, the researcher remained mindful of papers that became available in the media after this date.

1.2.1. Inclusion/exclusion of research

The research included focused specifically on the impact of STol and test anxiety in education. Literature which was not specific to the education context or that focused on anxiety or intelligence more generally was not included. Except for systematic reviews, only research based in western populations was included as it was felt that non-western attitudes and education systems differed too substantially; research conducted in the UK or the United States of America (USA) was deemed to be most appropriate. Some articles that were not in peer reviewed journals were included due to their relevance to the current research. Only documents published in English were included. In total, 101 references were included in the literature review.

2. Test Anxiety

2.1. Definition of test anxiety

Test anxiety can be considered as a “situation-specific personality trait” (Spielberger & Vagg, 1995, p.13) which can be largely split into three components: affective, cognitive and behavioural, with worry and emotionality as the major aspects (Liebert & Morris, 1967; Zeidner, 1998). Throughout the literature the terms test anxiety, examination anxiety, exam stress and evaluation anxiety are used interchangeably.

Worry constitutes a cognitive facet of test anxiety and can be triggered when individuals feel unable to cope with the demands of the test or are concerned about how others will evaluate them for poor performance (Sarason & Sarason, 1990; Zeidner, 1998). Consequently, worry is often related to threats in an evaluative situation. During adolescence, worry about how failure will be viewed by their peers

can be perceived as a very imminent threat, while concerns about how evaluation might affect their future reflects a longer-term concern (Friedman & Bendas-Jacob, 1997). Individuals who have more prior experiences of threat in a test context are likely to exhibit higher levels of test anxiety due to schemas they might have developed around evaluative situations (Zeidner, 1998).

Emotionality is highlighted as a key affective component of test anxiety (Spielberger & Vagg, 1995). However, as emotional arousal might be experienced in both high and low test anxious students, the degree to which it increases anxiety is largely down to the cognitive appraisal of the situation (Zeidner, 1998). Subsequently, whereas worry can result from a more general fear of failure and consequences in evaluative contexts, emotionality is likely to be specific to the test itself (Liebert & Morris, 1967). The emotionality component of test anxiety falls into two themes: cognitive obstruction and tenseness (Friedman & Bendas-Jacob, 1997).

The degree to which test anxiety is experienced can vary significantly between individuals (Sarason & Sarason, 1990; Von Der Embse & Witmer, 2014). Consequently, test anxiety might be best understood as a “unique configuration of constitutional, familial, social, educational and experiential factors” (Zeidner, 1998, p.168) that interact together to determine its development.

2.2. The aetiology of test anxiety

Many individual differences and subjective factors have been highlighted as playing a role in individuals’ responses to tests (Zeidner, 1998). Zeidner postulates several possible causes of test anxiety including, biological makeup, family environment and early socialisation, social learning and conditioning, the school environment and previous experiences of failure in evaluative situations.

Individuals might be “born with a basic “wired-in” propensity” (Zeidner, 1998, p.147) to the physiological responses associated with test anxiety. Test anxiety could be triggered by basic survival instincts, such as the ‘fight or flight’ response (Selye, 1936), causing physiological reactions when individuals feel threatened in a test. Individuals experiencing exam stress might be irritable, feel tense, show changes in eating habits or experience difficulties sleeping as well as physical ailments such as headaches or stomach pains (NHS, 2017). Test anxiety might also present as pupils

being unable to enter the exam room or freezing and being unable to adequately recall information (Zeidner, 1998).

However, if biological underpinnings do play a role in test anxiety, it is likely that they are triggered by personality characteristics and various aspects of the environment (Krohne, 1980, cited in Zeidner, 1998). For example, links have been shown between neuroticism and higher levels of test anxiety (Hoferichter & Raufelder, 2015). Research has also consistently indicated gender differences, with higher rates of test anxiety being shown in women (Putwain & Daly, 2014; Spielberger, Gonzalez, Taylor, Algaze & Anton, 1978). However, higher levels of test anxiety in women are not always associated with detrimental test performance (Hembree, 1988). One possible explanation for the gender differences could be that females are more inclined to be open about test anxiety and report it more strongly but in fact are not more anxious than their male counterparts who might not acknowledge or report their levels of anxiety.

Zeidner (1998) suggests that it is “the subjective meanings individuals attribute to environmental cues and events...that evoke threat perceptions and resultant anxiety” (p.183) in tests. The subjective influences on individuals’ experiences of test anxiety are related to cognitive processes and structures, self-related thinking and belief systems. The cognitive processes associated with fear of failure seem to be a prominent cause of test anxiety in UK students, manifesting in fears that failure will result in not being able to fulfil aspirations and/or concerns that failure will result in negative self-judgements or negative judgements from others (Putwain, 2009b).

Many psychological factors could also influence the degree to which test anxiety is experienced including, individuals’ appraisal of how the test results will impact on their self-esteem (Denscombe, 2000). Pupils also indicated that social factors, including teachers, schools and parents placing too high expectations on pupils and reiterating the importance of tests, increase pressure and act as key contributors to exam stress (Hutchings, 2015; Putwain, 2009a; Tait, 2015). It seems that pupils are aware of the schools need to perform well due to external pressures, such as the Office for Standards in Education (OFSTED), acknowledging that the additional pressure from teachers was often due to their own stresses. Pupils also highlighted the

social pressures from other children due to boasting about high grades or hurtful comments about poor performance.

Additionally, socio-economic background has been highlighted as a mediating variable between test anxiety and poor performance in tests, with those with a lower socio-economic status being at risk of poorer General Certificate of Secondary Education (GCSE) performance, partly due to test anxiety (Putwain, 2008d). Although those with a lower socio-economic background did show higher test anxiety scores, test anxiety is likely to only be part of the explanation for lower performance. For example, pupils from a lower socio-economic background might see less value in education or have families that do so. As such, “test-anxious individuals differ from their non-anxious counterparts in terms of an interpretative bias in processing ambiguous information in the external environment” (Zeidner, 1998, p.203).

As many factors can contribute to the presence of test anxiety, it is indicated that it “varies along a continuum, rather than simply being present or not” (McDonald, 2001, p.91). Furthermore, test anxiety is not believed to have one distinct presentation and instead can manifest itself in many ways (Zeidner, 1998). The composition of behaviours for those experiencing test anxiety can also show unexpected patterns, for example, students with higher levels of test anxiety might make more effort than their low test anxious counterparts in order to compensate (Putwain, 2008b). Consequently, theoretical models have been developed to try and explain the complex interactions that can lead to the development of test anxiety.

2.2.1. Theoretical models of test anxiety

Several theoretical models of test anxiety have been developed to try and explore how the trait is constructed (Zeidner, 1998). Zeidner presents several different models of test anxiety focusing on areas including emotional reactivity and heightened arousal, cognitive interference and self-deprecating thoughts, and feelings of being unprepared and a lack of competency. While the models differ considerably in their underlying assumptions, they all emphasise that test anxiety is a complex and multi-faceted construct.

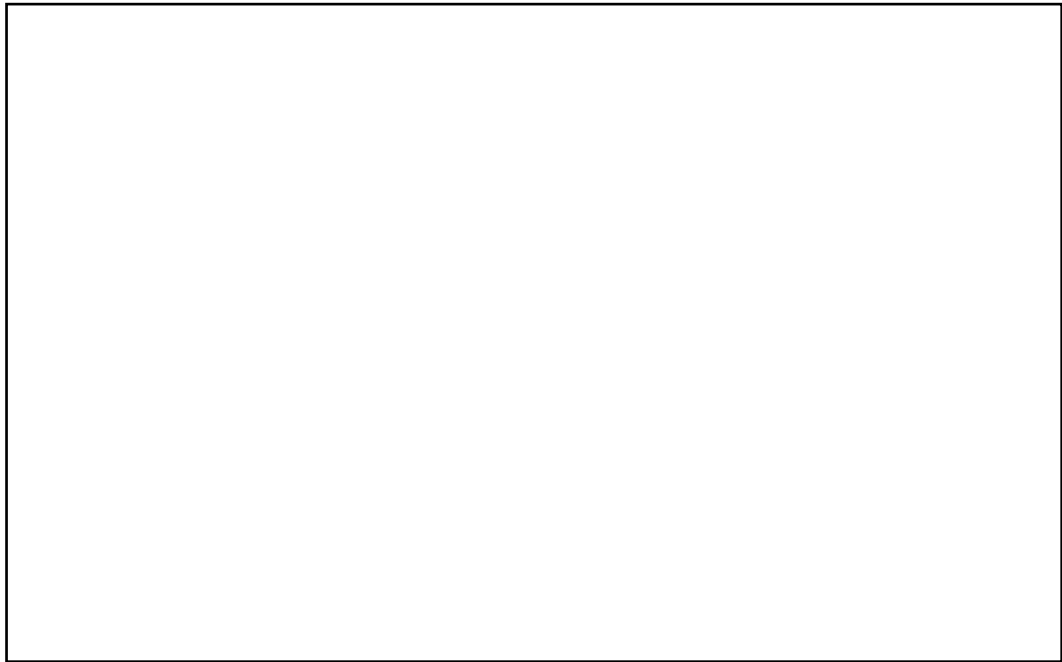


Figure 1: The self-regulative model of evaluation anxiety (Zeidner & Matthews, 2005). Reprinted from *Handbook of Competence and Motivation* (p. 154), by A.J. Elliot and C.S. Dweck (Eds.), London: The Guildford Press. Copyright 2005 by Guildford Publishing Inc. Copying done for the purpose of illustration for instruction.

In more recent years, several new models have been developed including the biosocial model (Lowe et al., 2007), the cognitive-behavioural model (Segool, Von Der Embse, Mata & Gallant, 2014) and the self-regulative model of evaluation anxiety (Zeidner & Matthews, 2007). The self-regulative model of evaluation anxiety (Figure 1) builds on previous models by focusing more explicitly on the processes involved (Putwain, 2008b). The model can be merited for exploring evaluation anxiety in a variety of contexts, including tests, social and sports situations. It emphasises the fundamental role of cognition in assessment anxiety, and the negative cycles that can be sustained leading to avoidance behaviours. Whilst such models are useful in giving a better insight into the processes that seek to cause and maintain assessment anxiety, they do not provide guidance on ways that test anxious individuals can be identified by those around them, offering very little in terms of presenting behaviours.

Given the complexity of the test anxiety construct, and a lack of awareness of the impact and signs, it is not surprising that teachers and parents might not make accurate judgements on children's test anxiety, therefore, it is likely that many pupils

go unnoticed (Karing, Dörfler & Artelt, 2015). As test anxiety can have a negative impact on pupils (Ergene, 2003), it is important to consider how it can be measured to identify those at risk.

2.3. Measuring test anxiety

Measures of test anxiety utilise the characteristics that have been identified as being key to the composition of the construct, including worry, emotionality and social consequences. Some signs of test anxiety can be observed, such as changes in sleeping and eating habits as well as behavioural signs including avoidance of the exam or freezing and being unable to recall information (NHS, 2017; Zeidner, 1998). However, research exploring test anxiety has also adopted a variety of standardised measures to assess the differences in pupils' attitudes towards tests.

A systematic review of test anxiety interventions (Von Der Embse et al., 2013) revealed six different scales for measuring test anxiety. The Test Anxiety Inventory (Spielberger, 1980) was the most used measure, being adopted in six of the ten studies included in the review. Further measures included the Friedben Test Anxiety Scale (Friedman & Bendas-Jacob, 1997), the Westside Test Anxiety Scale (Driscoll, 2007) and the Test Anxiety Scale for Children (Sarason, Davidson, Lighthall & Waite, 1958). Furthermore, Cassady and Johnson (2002) have developed a measure which focuses solely on the cognitive component of test anxiety. Some scales, such as the Test Anxiety Scale (Sarason, 1978), do not contain sub-scales focusing on different components and instead view test anxiety as a unidimensional construct (Putwain, 2008a) while others explicitly consider the different contributing factors.

It is not within the scope of this literature review to explore all the existing test anxiety measures in detail however, the Friedben Test Anxiety Scale (Friedman & Bendas-Jacob, 1997) and the Test Anxiety Inventory (Spielberger, 1980) are two which appear to be frequently used within the literature. The Friedben Test Anxiety Scale explores social derogation¹, cognitive obstruction and tenseness as the core components of test anxiety and therefore differs from many of the other measures

¹ The fear of humiliation in an individual's sense of self and self-efficacy when anticipated negative social feedback suggests that the individual's social and academic status is inferior.

which primarily focus on worry and emotionality. Subsequently, the scale encompasses the cognitive, affective and behavioural components outlined in the test anxiety definitions. Some criticism has been raised regarding the readability of the measure, with words such as 'derogates' perhaps not being accessible to the wider adolescent population (Cizek & Burg, 2006). However, the measure is considered to have good reliability and validity, showing good construct validity with Spielberger's (1980) Test Anxiety Inventory (Friedman & Bendas-Jacob, 1997).

Within Spielberger's (1980) Test Anxiety Inventory, test anxiety is characterised by two core components: worry and emotionality. It has been translated and adapted into several different languages and is the most widely used measure of test anxiety amongst secondary school and university students (Chapell et al., 2005; Cizek & Burg, 2006). It built on previous test anxiety measures and aimed to simplify and generalise the language used to make it more globally accessible (Spielberger et al., 1978). The measure is referred to as the Test Attitude Inventory on copies given to participants as Spielberger considered that it would not be helpful to use the term 'anxiety' during administration (Spielberger, 1980). Higher total scores indicate higher levels of test anxiety and separate scores can be obtained for the emotionality and worry components of test anxiety. It is reported to have good reliability and good concurrent, construct and discriminative validity (Spielberger, 1980).

2.4. The impact of test anxiety

Test anxiety can have a negative impact on pupils, leading to reduced cognitive performance, poorer attainment and psychological distress, including a long-term impact on mental health (Denscombe, 2000; Von Der Embse & Witmer, 2014; Zeidner, 1998). Academic stress, including examination stress, has been highlighted as one of the key stressors for pupils, finding elevated levels of depression, anxiety and stress the month prior to externally assessed examinations (Owen-Yeates, 2005; Robinson et al., 2009). However, there are considerable individual differences in the impact test anxiety can have on pupils, with some test anxiety having a positive impact in encouraging more thorough preparation for tests (Von Der Embse & Witmer, 2014).

Test anxiety is most pertinent in high-stakes tests, such as those that have important consequences for pupils, teachers and schools, perhaps because of worries

about how the tests could impact on future opportunities (Denscombe, 2000; Putwain, Daly, Chamberlain & Sadreddini, 2015; Segool, Carlson, Goforth, Von Der Embse & Barterian, 2013). In the UK, high-stakes examinations would include the GCSE exams and the General Certificate of Education (GCE) Advanced Level, otherwise known as A-Levels. Due to the profound impact that test anxiety can have, tests might assess pupils' ability to cope with the pressure and anxiety caused by tests rather than their cognitive ability (Zeidner, 2007). Furthermore, with test anxiety acting as a contributor to mental health difficulties, and mental health being raised as a key issue for children and young people in the UK (DoH, 2015), it is becoming increasingly important for research to explore the area further.

2.4.1. Voice of the child

Research commissioned by the National Union of Teachers (NUT) found that children in England are showing increasingly high levels of school-related anxiety and stress, due to increased exam pressure, greater awareness of their own academic failures at a younger age, and the increased academic rigour and demands (Hutchings, 2015). Children have reported difficulties eating, sleeping and concentrating as just some of the behavioural responses to exam stress (Childline, 2016). Test anxiety can be particularly problematic for those who are already experiencing emotional problems or mental health difficulties (Youngminds, 2016).

In 2015/2016, test anxiety was raised as an issue for 4204 children in Childline counselling sessions, indicating an increase of 11% from the previous year. Children commented that they felt overwhelmed by the whole exam process with many pupils already viewing themselves as failures therefore reducing their motivation to revise. Several pupils reported that the extreme levels of anxiety they experienced due to the pressure of tests had resulted in them feeling stressed, depressed and, in some cases, leading to self-harm; findings which had previously been indicated in other research (Denscombe, 2000).

2.4.2. Test anxiety and academic performance

Many studies have highlighted the detrimental impact test anxiety can have on pupils' performance in tests (e.g. Von Der Embse & Witmer, 2014), although this impact is moderate for most pupils. Test anxiety can affect exam performance for many reasons, including pupils' minds going blank or freezing in the exam (Emery & Krumboltz, 1967). Research in two American high schools indicated that 4-15% of the variance in students' test scores could be attributed to test anxiety (Von Der Embse & Hasson, 2012); a proportion that could be considered significant in high-stakes tests. However, the study did not control for prior academic attainment and only correlation, not causation, can be inferred from their findings. Furthermore, for those with the very highest levels of test anxiety, the impact might be much more significant than overall data shows due to the variance being averaged out by those with lower levels.

The worry aspect of test anxiety is indicated to have a more significant impact on test performance than emotionality (Hembree, 1988); suggesting that cognitive deficits play a greater role than affective processes. Furthermore, Zeidner and Matthews (2005) suggest that evaluation anxiety is likely to impact on performance as dysfunctional self-beliefs about the test situation lead individuals to focus their attention on these maladaptive thoughts. Conversely, academic buoyancy² is related to lower levels of worry, with pupils experiencing higher levels of academic buoyancy being more likely to attain higher test scores (Putwain et al., 2015). Consequently, EPs might have a valuable role in working with pupils and schools to develop academic buoyancy, perhaps through interventions rooted in positive psychology or academic resilience (Putwain et al., 2015).

Research conducted with Year 11 pupils in three UK secondary schools found a small, but significant, relationship between test anxiety in Key Stage 4 and GCSE exam performance (Putwain, 2008d). Worry was shown to have a more significant impact on test outcomes than emotionality, supporting previous findings (Hembree, 1988), with socio-economic status acting as a moderating variable between test anxiety and test performance. The research highlights the importance of not assuming a causal

² Academic buoyancy can be considered as the ability to withstand setbacks and challenges in the educational domain.

relationship between test anxiety and test performance and ensuring that other potential mediating variables are considered.

Similar findings have been shown in a recent study with 1134 American 11th grade students (Von Der Embse & Witmer, 2014). Even when controlling for demographic variables and academic achievement, test anxiety still accounted for 1-2% of the variance in test performance. Cognitive obstruction was shown to have the strongest negative relationship with test performance while social derogation was positively related to test results. It is therefore postulated that concerns about tests having a negative impact on social status could have a positive influence through encouraging students to engage in more thorough preparation for exams.

A pilot study conducted with A-Level pupils found that many considered their experience of test anxiety to have a positive impact on test performance although, test anxiety leading up to their exams could negatively affect preparation (Chamberlain, Daly & Spalding, 2011). However, the research only collected qualitative data on pupils' perceptions therefore, reflecting subjective interpretations. As no objective measures were used, how the individual personally defined test anxiety might not fall within traditional definitions in the wider literature. It is also important to consider the small-scale nature of research conducted within the context of a pilot study.

Test anxiety might have both facilitating and debilitating contributions to individuals' academic performance (Putwain, 2008c; Putwain, 2009a). Facilitating effects include motivating pupils to engage in more conscientious preparation for examinations due to concerns about failure; findings which contrast with Chamberlain et al. (2011). Similar effects could be seen regarding coursework, with a degree of pressure helping to motivate pupils to complete work and manage their workload more effectively. However, there is a fine balance between test anxiety being facilitating and debilitating, with too much pressure being acknowledged as potentially causing pupils to become overwhelmed with stress (Putwain, 2009a). Furthermore, pupils felt that test anxiety could have a debilitating impact in causing deficits to their cognitive skills. Given the potentially negative effects of test anxiety, it is important to consider strategies to support pupils.

2.5. Strategies to reduce test anxiety

A recent study based in UK secondary schools indicated that over 5% of pupils consider themselves to be highly anxious about tests (Putwain & Daly, 2014). Although test anxiety might not have a detrimental effect on all pupils' performance, it seems that many would benefit from support. Supporting schools in implementing test anxiety interventions might also have benefits for wider mental health initiatives by highlighting the relevance and importance of supporting pupils experiencing anxiety to school staff (Weems et al., 2010). Additionally, by educating pupils in strategies to reduce test anxiety, there might be wider benefits for anxiety more generally as well as increasing feelings of self-efficacy if reduced anxiety supports improved test performance. Supporting pupils to develop broader skills might also be beneficial, with resilience and strong social relationships being indicated as protective factors against test anxiety and positive contributors towards higher test performance (Hoferichter & Raufelder, 2015; Putwain, Nicholson, Connors & Woods, 2013).

The issue of exam stress is increasingly being highlighted outside of the academic literature, with many online resources offering self-help guides for pupils and guidance for parents (e.g. NHS, 2017; NSPCC³, 2009). The articles offer advice ranging from revision and exam strategies and guidance on basic self-care during the exam period, such as eating and sleeping well. Parents are also encouraged to be supportive and reduce pressure by being reassuring and positive. Relaxation techniques, such as breathing exercises and mindfulness practices, are also recommended as potential self-help strategies (Childline, 2017).

Despite the need for supportive strategies, a systematic review of test anxiety interventions for children and adolescents between 2000 and 2010 found only ten studies focusing on interventions for nursery, primary and secondary aged pupils, with just one UK study (Von Der Embse et al., 2013). The systematic review found positive outcomes for interventions adopting both behavioural and cognitive approaches as well as academic skills building and biofeedback. However, many of the studies had not been replicated. The systematic review highlights the need for more studies exploring the impact of test anxiety interventions with school-aged pupils, particularly

³ National Society for the Prevention of Cruelty to Children

using UK samples. Much of the existing research focuses on college and university students therefore, the findings cannot necessarily be generalised to schools (Ergene, 2003).

Gregor (2005) conducted research with 105 Year 11 pupils in one UK secondary school. The research was carried out by an EP following a school request to support pupils in managing their test anxiety. The study compared three experimental conditions: relaxation, cognitive-behavioural approaches, and a mixed methods approach combining the two strategies, as well as a control condition. The strategies aimed to equip pupils with life skills to self-manage their test anxiety. Each experimental group received five forty-five minute sessions delivered by the EP and a teacher. The study appears to have taken a pragmatic approach and used a mixture of quantitative and qualitative measures to gather sufficient information on whether the intervention was successful and valued by pupils.

Findings from Gregor's (2005) research indicated that a mixed approach to intervention was most successful. Mixed approaches might be more beneficial as they provide pupils with a range of skills, allowing them to select the strategies they find most useful. Whilst trying to implement a scientific research design in a real-life setting is difficult, the intervention offers a practical example of how EPs could potentially achieve similar positive effects in schools. However, the research was conducted with a limited population therefore replications of this study are required to aid generalisability.

Despite indications of the debilitating influence that a fear of failure can have, it seems that teaching staff will often use threat-based messages focusing on students' fear of failure in the time leading up to exams (Putwain, 2009a). The use of fear messages, in oppose to efficacy messages, has been shown to reduce motivation in pupils (Sprinkle, Hunt, Simonds & Comadena, 2006). Fear appeals focus on the exam's impact on future aspirations and, when pupils view these fear appeals as threatening, can be associated with higher levels of worry, tension and bodily symptoms associated with test anxiety (Putwain & Roberts, 2010). Consequently, the use of fear appeals has been shown to reduce performance in high-stakes tests (Von Der Embse, Schultz & Draughn, 2015). Teachers could have a valuable role in supporting pupils to reduce their test anxiety by providing efficacy based messages, which focus on productive

actions the student can take to prepare for the examination, rather than threats about how failure could have implications for future aspirations.

Recently, positive outcomes have been found from internet-based interventions using cognitive-behavioural approaches without the need for specialist practitioners to be present (Orbach, Lindsay & Grey, 2007; Putwain, Chamberlain, Daly & Sadreddini, 2014). Although the interventions were successful in reducing test anxiety, there were issues with pupils not fully completing aspects of the programme at home. Accordingly, it seems that similar interventions would be better completed within the school setting therefore still requiring some degree of facilitation.

Despite a focus within the literature on the impact of test anxiety as the primary cause of academic anxiety, research with Key Stage 4 pupils has suggested that coursework might cause the greatest level of stress (Putwain, 2008c). Consequently, suggestions to reduce levels of test anxiety by introducing more coursework based assessment might not produce positive effects. During Key Stage 4, pupils are having to manage several competing academic pressures which can become overwhelming and have a detrimental impact on performance. Subsequently, schools need to ensure that a cohesive approach is offered across subjects to reduce pupils' demands wherever possible.

2.5.1. Cognitive strategies to reduce test anxiety

Research exploring anxiety in young people has found significant relationships between anxiety and cognitive distortions⁴, with catastrophizing, overgeneralising and personalising all relating to children's levels of anxiety (Weems, Berman, Silverman & Saavedra, 2001). More specifically, research conducted with Year 11 pupils from two UK secondary schools found that cognitive distortions relating to the academic domain mediate the relationship between test anxiety and examination performance (Putwain, Connors & Symes, 2010). The study used questionnaires to assess pupils' levels of test anxiety and cognitive distortions approximately two months prior to their GCSE exams. Consistent with previous research, the study found small relationships between test anxiety and test performance. Consequently, interventions which target

⁴ Cognitive distortions can be defined as exaggerated or irrational thought patterns which impact on individuals' psychological functioning and behaviour (Beck, 1989).

cognitive distortions in the academic domain might be beneficial in reducing the potentially negative effects of test anxiety. The findings are supported by research suggesting that reduced levels of cognitive distortions act as one of the greatest protective factors against the negative experiences of students prior to examinations (Robinson et al., 2009).

Many successful interventions targeted at reducing test anxiety include principles grounded in cognitive theory (Von Der Embse et al., 2013). Targeted academic interventions might be more beneficial than specific test anxiety interventions and supporting students to cope with the cognitive aspects of pressure from tests might be most beneficial in improving test performance (Von Der Embse & Witmer, 2014). Research with 11-12-year-old pupils has indicated that allowing them to spend one minute looking through their mathematics paper prior to solving the problems reduced anxiety and enhanced performance in those with low, medium and high test anxiety (Mavilidi, Hoogerheide & Paas, 2014). By allowing pupils to focus their mind effectively on task relevant information, it helped to reduce the focus on intrusive thoughts and increase their confidence. Similar findings have been shown when elementary school pupils engaged in mindfulness colouring practices 15 minutes prior to a spelling test (Carsley, Heath & Fajnerova, 2015). Such strategies could provide quick and easy ways for schools to reduce the potentially detrimental impact of test anxiety. Further research is needed to explore whether similar strategies are beneficial for older pupils.

Research exploring characteristics which might make an individual susceptible to the negative effects of test anxiety seem to fit well with the dichotomies associated with STOI (Dweck, 1999). Zeidner (1998) suggests that individuals who show higher levels of test anxiety are more likely to see tests as a threat, hold a greater fear of failure and experience a helpless response; all characteristics which fit well with an entity theory of intelligence (Dweck, 1999). In contrast, Zeidner posits that those who do not place so much subjective importance on the test, see tests as a challenge, and have feelings of self-competence are more likely to experience lower levels of test anxiety; similar characteristics to an incremental view of intelligence. Zeidner also outlines that, given the information at the time of his work, “a critical element in any intervention program aimed at ameliorating test anxiety would be in reshaping those

negative schemata, self-perceptions, and maladaptive attributional patterns associated with test anxiety” (p.203). Given that the characteristics experienced within test anxiety and STol seem to coincide, it is possible that interventions which have been indicated as successful in shifting STol, might also have a beneficial impact on test anxiety.

3. Self-theories of intelligence (STol)

3.1. Definition of self-theories

Self-theories describe the beliefs individuals hold about themselves and how their minds work (Dweck, 1999). “People develop beliefs that organize [sic] their world and give meaning to their experiences” (pp.xi); otherwise known as ‘meaning systems’. Individuals can also hold ‘meaning systems’ about other people known as ‘other-theories’.

Dweck’s (1999) self-theories forms a type of attribution theory whereby individuals’ behaviour is determined by the attributes they perceive themselves as possessing and the way they explain their own behaviour. Weiner (1985) suggests that how individuals classify the causes of success or failure, be it as a stable and uncontrollable attribute or as a changeable and unstable attribute, will influence how they feel about the likely outcomes of future endeavours. It is suggested that “implicit theories might create the meaning framework in which attributions occur” (Hong, Chiu, Dweck, Lin & Wan, 1999, p.588).

Self-theories are believed to be stable over time and are largely domain specific (Dweck, Chiu & Hong, 1995a; Robins & Pals, 2002). Consequently, individuals might hold an incremental view in one aspect of their life and an entity view in a different area. Dweck (1999) suggests that self-theories form part of individuals’ personalities, with self-theories and personality both being relatively stable but can be susceptible to change.

Self-theories can have an impact on many aspects of individuals’ lives including beliefs, goals, behaviour patterns and motivation (Chiu, Hong & Dweck, 1997; Dweck,

1999; Dweck & Leggett, 1988). The most pertinent beliefs within the academic domain are suggested to be individuals' STol (Dweck, 1999).

3.2. STol

STol describe the ideas individuals hold about the nature of their intelligence and can be broadly divided into two categories: incremental theory and entity theory (Dweck, 1999; Dweck & Leggett, 1988). Individuals who hold an incremental theory "believe that intelligence is a malleable, increasable, controllable quality" (Dweck & Leggett, 1988, p.262); a concept also known as a 'growth mindset'. Incremental theorists do not believe that everyone has the same intellectual capacity, but that everybody can grow and develop their intelligence through effort, hence creating a desire to learn (Dweck, 1999). Individuals with an incremental view will seek to develop mastery-oriented skills and focus on competence acquisition by pursuing learning goals (Dweck & Molden, 2005; Robins & Pals, 2002).

Conversely, individuals who hold an entity theory believe that intelligence is a fixed trait that cannot be controlled or changed (Dweck, 1999); a concept also known as a 'fixed mindset'. Entity theorists want to look and feel intelligent therefore seek easy successes and avoid learning opportunities that might cause potential challenge. Those individuals with an entity view are more likely to have a learned helplessness response in the face of challenges as they seek competence validation in the form of performance goals (Dweck & Molden, 2005; Robins & Pals, 2002).

Gender differences have been indicated, suggesting that females are more likely to hold an entity view and avoid challenges than their male counterparts (Dweck & Leggett, 1988). Additionally, academically intellectual females are more likely to choose tasks that they know they can succeed in compared to males who would seek challenge (Licht & Shapiro, 1982, cited in Dweck, 1999). It is suggested that both types of intelligence are equally popular, with about 40% endorsing an entity theory, 40% endorsing an incremental theory and 20% who are undecided (Dweck & Master, 2008).

Dweck's theory can be criticised for not considering that individuals could simultaneously hold both beliefs concurrently (Schunk, 1995). For example, pupils might believe that their intelligence has an upper limit but that this limit can be reached through effort and persistence. Moreover, Kristjánsson (2008) argued that

Dweck's work is too divisive, forcing individuals to fall within the strict dichotomies of either having an incremental or an entity view. Realistically, few individuals hold such a definitive view. Dweck (2006) has admitted that the rigidity of categorising people into one of two perceptions was developed "for the sake of simplicity" (p.46) however, the literature on STol continues to articulate such a stringent view. The categories within which people fall can be determined by scales devised by Dweck and her colleagues (Dweck, 1999; Dweck et al., 1995a).

3.3. Measuring STol

The Implicit Theory of Intelligence Scale (Dweck, 1999) is a self-report measure that requires individuals to rate their attitudes to statements relating to intelligence. Agreement with statements such as, 'Your intelligence is something about you that you can't change very much' would indicate a more entity perspective, while agreement with statements such as, 'No matter who you are, you can significantly change your intelligence level' would suggest a more incremental view. Participants' responses to the scale are calculated to attain a mean score ranging from one to six. Overall scores below three are entity theorists while those scoring above four are incremental theorists. Any participants who fall between three and four are undecided. The measure has been adapted for use with children and is reported to be a valid and reliable measurement tool (Dweck, 1999, Dweck et al., 1995a). The STol measures do not correlate with other measures and are indicated as being "distinct from other cognitive and motivational constructs" (Dweck, 1999, p.176).

De Castella and Byrne (2015) sought to develop an adapted version of Dweck's measure, reframing the questions to focus on individuals' personal ability to develop their own intelligence. For example, 'No matter who you are, you can significantly change your intelligence level' was rephrased to 'With enough time and effort I think I could significantly improve my intelligence level'. The research found that, when the questions focused more specifically on personal ability, less people endorsed an entity view. It is suggested that believing your personal intelligence is more malleable than that of others might have protective benefits for self-esteem and academic self-concept. Although the measure is yet to be widely used, the initial research seems to suggest that phrasing questions in a more personal way accounts for a greater amount

of the variance in the relationship between STol and goal orientation, attributions, academic attainment, non-attendance and levels of engagement.

3.4. Relationships between STol and other behaviours

Relationships have been found between STol and motivation, self-esteem, response to challenge and goal-orientation, amongst other factors (Dweck, 1999; Dweck & Leggett, 1988; Robins & Pals, 2002; Yeager & Dweck, 2012). Despite self-theories being viewed as stable (Dweck et al., 1995a; Robins & Pals, 2002), research suggests that STol can be altered through interventions which seek to teach and prime participants to an incremental view, finding positive changes in pupils' achievement, academic engagement, motivation, enjoyment of the academic process and resilience following interventions (Aronson et al., 2002; Blackwell et al., 2007; Yeager & Dweck, 2012).

Most research indicating positive outcomes of STol interventions has been conducted by Dweck or her colleagues at Stanford University whilst research conducted by others has often not found as strongly positive effects (e.g. Donohoe, Topping and Hannah, 2012). However, although STol interventions have shown success, Dweck has acknowledged that the effects of shifting participants STol to an incremental view might not be sustained over long periods of time (Blackwell et al., 2007; Dweck, 1999).

3.4.1. Effort and approach to task

Research suggests that STol are related to the amount of effort displayed in daily approaches to tasks (Rickert, Meras & Witkow, 2014). High school students holding a stronger entity theory were more likely to display self-handicapping⁵ and procrastination behaviours in addition to showing a reduced responsiveness to daily school demands. The research went beyond self-report measures by recording the perceived daily demands of schoolwork throughout the two-week period. Findings from the research could have important implications for other areas associated with STol, such as academic attainment, as it is possible that individuals who procrastinate

⁵ Creating obstacles to compensate for possible future poor performance therefore allowing the individual to give an external cause for failure.

more and are less reactive in school are less likely to input the effort required to succeed academically. In support of the findings, research has found that holding an entity theory is related to “increased self-handicapping, truancy, and a greater likelihood of giving up on school altogether” (De Castella & Byrne, 2015, p.258).

Conversely, holding an entity theory has been shown to have positive adaptations to effort when tasks are framed in a particular way (El-Alalyli & Baumgardner, 2003). When the focus was only placed on performance goals, entity theorists would display increased effort while incremental theorists reduced their effort. It is possible that entity theorists felt they needed to increase effort to prove their ability, while incremental theorists reduced their effort as they did not feel they had anything new to learn from the second attempt at the task. However, level of effort remained the same for both incremental and entity theorists when told that they had high ability. Despite the positive response in relation to performance goals, entity theorists did show a more negative emotional response, regardless of whether they experienced success or failure, potentially because viewing intelligence as a static quality creates a sense of feeling out of control.

3.4.2. Goal orientation

Relationships have been shown between individuals’ STOI and goal orientation, with incremental theorists being more likely to endorse learning goals whilst entity theorists show a preference for performance goals (Dweck, 1999). Furthermore, the way goals are framed plays a role in determining children’s response to task (Elliot & Dweck, 1988). Learning goals can have a positive effect on intrinsic motivation and performance, with those who endorse learning goals showing greater mastery-oriented coping strategies and persistence in the face of failure (Grant & Dweck, 2003). Furthermore, advocating learning goals can lead to higher academic performance through a tendency to engage in deeper processing; factors which are particularly relevant when a task is challenging or personally important. Consequently, to engender a more incremental view, Dweck (1999) suggests that praise should focus on effort and process rather than outcomes and achievement.

Individuals who hold an incremental view are likely to manage setbacks more positively as they will opt to focus on making plans and viewing how increased effort

could improve their performance, at least partially due to their endorsement of learning goals (Smiley, Buttitta, Chung, Dubon & Chang, 2016). However, praising for effort might simply be better than praising ability therefore, objective feedback might be equally beneficial (Skipper & Douglas, 2011). Some research has found weak relationships between STol and goal orientation (Kennett & Keefer, 2006), possibly as university students were asked to choose between challenge or higher grades in a context where attaining good grades had an impact on their future therefore, students would be expected to opt for performance over learning.

O'Keefe (2013) discussed the impact of STol on how individuals evaluate their competences. He suggests that individuals who hold an incremental view are more likely to evaluate their progress in relation to their own previous performance. Conversely, those who hold an entity theory are more likely to self-assess in relation to others' performance. Incremental theorists seek opportunities for self-improvement following their increased effort or adapted strategies while entity theorists avoid challenges as it could pose a threat to their sense of self if they experience failure. Consequently, entity theorists will often seek to engage in self-enhancement through placing a more external locus of control on any potential failures in order to not impinge on their sense of self, helping to reduce any potential cognitive dissonance.

3.4.3. Aspirations

Relationships have been found between STol and pupil aspirations (Ahmavaara & Houston, 2007). The relationship was mediated by whether the pupil attended a selective grammar school or a non-selective secondary school, as well as the pupils' confidence in their intelligence, perceived performance and self-esteem; highlighting several contributing factors. The research did not support previous assertions that females are more likely to hold an entity theory of intelligence (Dweck & Leggett, 1988) with no gender differences being indicated. However, the research was conducted in only one local authority that places a lot of emphasis on the role of selective schooling. Consequently, the factor of selective education could potentially be so considerable that it is hard to determine the actual influence of STol.

Further research has indicated that individuals' focal point when considering aspirations and wishes differs depending on their STol (Sevincer, Kluge & Oettingen,

2014). Incremental theorists are likely to focus more on the future and use this to determine how they can fulfil and pursue their goals. Focusing more on the future fits well with a view that abilities can be improved and developed through effort while focusing on the current reality when considering wishes would make sense when an individual holds a core belief that ability cannot be developed. Findings were replicated in both academic and sports domains.

3.4.4. Achievement

A modest relationship has been found between STOI and general intelligence, suggesting that highly intelligent individuals are more likely to hold an entity theory (Spinath, Spinath, Riemann & Angleitner, 2003). It is possible that viewing intelligence as a more stable characteristic could provide an “optimistic, self-serving view for someone who possesses much of this desirable quality and is aware of that” (p.949), acting as a protective factor for their sense of self. The findings contradict Dweck’s (1999) view that holding an entity theory is maladaptive, as holding this view might protect individuals from viewing failure as a lack of overall intellectual ability as intelligence is seen as stable. Findings that holding an entity theory can have positive adaptations is supported by El-Alayli and Baumgardner (2003).

Aronson et al. (2002) explored the impact of stereotype threats⁶ on pupils’ academic performance, aiming to reduce the negative impact by encouraging participants to view intelligence as a flexible quality that can grow and develop. The study consisted of 79 African-American and Caucasian undergraduate students from Stanford University. Participants were split in line with their ethnicity and then randomly allocated into either the malleable pen pal condition (which promoted an incremental view of intelligence), the control pen pal condition (writing a letter without the incremental view message) or the no pen pal condition. Both African-American and Caucasian students showed improvements following three sessions promoting an incremental view compared to those in the other conditions. Furthermore, the malleable pen pal condition reported greater enjoyment in the

⁶ Individuals experience stereotype threats when a widely-held view about a specific group’s intellectual abilities causes extra cognitive and emotional burdens for those in the stereotyped group. Consequently, stereotype threats can cause apprehension about confirming the stereotypical beliefs in their views of themselves and the way they are viewed by others.

academic process, greater academic engagement and better grades following the intervention. The changes following the intervention seemed to be more significant and more persistent in African-Americans, finding that changes in attitudes remained at a nine-week follow-up; perhaps because they have most to benefit from holding this view. However, the relatively small sample size and the potential lack of generalisability from research conducted in one university should be acknowledged.

The difficulty with studies exploring the impact of STol on achievement outcomes is that they usually explore the relationship at one time point rather than the longer-term trajectory (Blackwell et al., 2007). Furthermore, many studies do not account for potential mediating factors and the processes and mechanisms which link the two factors together. Blackwell et al. attempted to fill gaps in the existing literature by exploring the impact of STol on the longer-term trajectory of pupils' academic achievement and investigating the role of other variables using a mediational model. The research indicated that the relationship between STol and achievement is mediated by four motivational variables. Pupils with an incremental view are suggested to achieve better grades due to the relationship being mediated by stronger learning goals, positive strategies in response to failure, positive effort beliefs and fewer helpless attributions. Those with an incremental view were recorded as outperforming their entity peers in mathematics nearly two years later. Attainment prior to attending junior high was not related to STol suggesting that STol only influence differences in achievement patterns during a challenging transition. While a sample containing 373 students represents a reasonable sample size, the research was only conducted in one school therefore, similar studies would need to occur across several other settings to validate these findings.

Given the positive relationship shown between an incremental view of intelligence and academic attainment, Blackwell et al. (2007) sought to establish whether STol could be changed through an intervention to allow those with an entity view to reap the benefits associated with an incremental perspective. Those in the experimental condition, consisting of eight 25-minute sessions, showed significant shifts to an incremental view and positive improvements in their academic attainment. Those who initially held an entity theory prior to the intervention were most likely to show the greatest increases in attainment following the sessions. Specifically, the

intervention halted the decline in academic performance that some of the pupils had been experiencing while those in the control group continued to decline. However, there is still a need for the sustainability of the changes to be assessed over a longer period to establish whether, without further input, pupils are likely to regress to their initial STol.

Recent research found no significant effects on academic attainment or resiliency following a STol intervention (Donohoe et al., 2012); contradicting previous findings (Aronson et al., 2002; Blackwell et al., 2007). Furthermore, although positive changes were observed in pre- and post- STol scores in the intervention group, these changes were not sustained when assessed at a three-month follow-up, questioning the longer-term impact of STol interventions. Individuals' own feelings of self-evaluation and self-doubt can be influenced by the STol espoused by those around them, offering an argument for interventions which aim to make systemic changes in attitudes across whole classes or schools (Reich & Arkin, 2006). Consequently, systemic interventions might help to provide the input required to promote more ongoing benefits. Donohoe et al.'s research was conducted in only one secondary school therefore, it might not be possible to generalise the findings. However, the study does highlight the need for more research conducting follow-up investigations to explore whether changes remain consistent overtime.

Similarly, research conducted in the UK did not find statistically significant benefits of STol interventions on pupils' attainment in mathematics and English (Education Endowment Foundation, 2015). Although greater improvements were seen in the experimental group compared to the control, the findings were not considered to be great enough to have not potentially occurred by chance. It is argued that the findings might have been contaminated as both intervention and control schools were already using STol approaches which could have led to more universal benefits for both groups and prevented the differences from being statistically significant.

Many of the STol interventions consist of ongoing input over several weeks (e.g. Blackwell et al., 2007). Although these interventions have been successful, it might not always be feasible for prolonged input to be given. Consequently, briefer interventions need to be explored to see if they can provide similar effects.

3.5. Brief STol interventions

Brief interventions aiming to promote an incremental view of intelligence have been beneficial, with positive effects after only one thirty-minute intervention (Paunesku, Yeager, Romero & Walton, unpublished, cited in Yeager & Dweck, 2012). Furthermore, when assessed several months later, the intervention had a substantial effect on the pupils' resiliency, measured by the drop-out rates for the class, and attained better grades than their peers in the control condition. Although this study found positive results, to date the research is yet to be published and peer-reviewed therefore, the findings should be accepted cautiously.

As with recent test anxiety interventions (e.g. Putwain et al., 2014), it seems that interventions to promote an incremental STol are also utilising information technology. Research indicated that one forty-five-minute session of an online intervention focusing on developing academic STol raised achievement in underperforming students (Paunesku et al., 2015). The study compared the impact of a brief STol intervention, a sense-of-purpose intervention, or a combination of the two. Findings indicated that all three interventions raised students' academic attainment. Of interest to the current research, the brief STol intervention consisted of students reading information about how the brain can grow and develop, writing a summary of the information, and writing a letter advising a struggling student based on the information in the session. The study can be credited for having a large sample size of 1594 students from 13 geographically diverse high schools therefore, aiding generalisability. However, the interventions were only completed with underperforming students and predominantly only raised academic attainment in those pupils who were at risk of leaving school, raising questions of how useful these findings are to students who are not underperforming or at risk of withdrawing from education.

3.6. STol and academic anxiety

Dweck (1999) suggests that individuals who do not hold a 'mastery-oriented' perspective of academic work are likely to fear challenges as failure could act as a threat to their self-view of their academic abilities. Consequently, individuals who have not developed mastery-oriented qualities might be more likely to experience academic

anxiety. As a mastery-oriented perspective is associated with an incremental view of intelligence, it could be assumed that there might be some relationship between individuals' STOI and levels of academic anxiety.

Previous research has indicated that entity theorists are significantly more anxious about their schoolwork and would doubt their intelligence if they did not achieve high marks (Henderson & Dweck, 1990). Additionally, entity theorists attained significantly lower results, regardless of their previous performance, during the transition to secondary school. It seems that for entity theorists, previous success does not act as a protective factor when faced with adversity. Entity theorists might avoid challenging situations to escape potential failure as negative academic outcomes could cause them to question their intellect. Consequently, by addressing pupils' STOI it might be possible to improve academic performance and reduce anxiety. However, the pupils' in the research were all underachieving therefore, the findings might not be representative of higher achieving pupils. The focus on underachieving students is particularly pertinent as individuals who are more intellectually capable, and have previously received praise for their high achievement, are likely to present more opposition to being too stringently tested as they might be more concerned about failure and therefore, resist challenges and struggle with setbacks; indicating that success does not necessarily promote a desire for challenge and provide skills to cope with obstacles (Dweck, 1999; Dweck & Leggett, 1988).

Individuals who might be at risk of 'stereotype threat' have shown increases in test performance following interventions targeting STOI and shifting attributions of academic setbacks by emphasising that most people experience difficulties (Good et al., 2003). The research focused on female, minority and low-income students, finding positive effects in all groups. Consequently, interventions focusing on STOI might have a positive impact on levels of test anxiety in other populations. Furthermore, research with Australian psychology undergraduates suggests that embedding a short series of interventions focusing on promoting an incremental view of intelligence led to reductions in maths anxiety (O'Shea & Swan, 2011). However, these findings should be cautiously accepted as the research has only been published as an abstract following presentation at a conference. Subsequently, it is not possible to explore the details of the research nor has it been peer-reviewed.

4. Rationale

4.1. Relevance to EPs

EPs could have a valuable role in supporting pupils to manage their test anxiety, with the skills required to target support at consultation, individual pupil and school wide levels of intervention (Hoferichter & Raufelder, 2015; Von Der Embse & Hasson, 2012). Additionally, research has highlighted the importance of EPs assessing individual differences when targeting test anxiety and considering the different manifestations of the construct (Putwain, 2008d).

A core part of the EP role is in providing psychologically based interventions (Scottish Executive Education Department, 2002) and STol are particularly relevant to EPs due to their influence on a wide range of learning behaviours including, effort, goal orientation and achievement (Blackwell et al., 2007; Elliot & Dweck, 1988; Rickert et al., 2014). Furthermore, research conducted in the UK has suggested that STol interventions are most successful when principles are embedded at a systemic level and consistently reinforced over time (Education Endowment Foundation, 2015). EPs might be well positioned to support schools in developing school wide STol approaches through providing input in the form of direct intervention with pupils, teacher training and ongoing support through their relationships with schools.

4.2. Rationale for the current research and research questions

Test anxiety is a significant problem for many pupils in the UK, leading to unfavourable outcomes in academic performance and psychological wellbeing, including potential long-term impacts on mental health (Denscombe, 2000; Putwain, 2008d). Consequently, it is important for educational professionals to find effective ways of supporting students with their test anxiety. EPs' professional knowledge and understanding of psychology means that they might be particularly well positioned to support pupils, and schools, in developing strategies.

Cognitive factors play a significant role in test anxiety therefore, interventions based on cognitive theories might be beneficial (Putwain et al., 2010; Robinson et al., 2009). Interventions which encourage students to view intelligence as a malleable

construct can lead to improvements in academic outcomes with relationships between pupils' STol and academic anxiety (Good et al, 2003; Henderson & Dweck, 1990). Furthermore, it would be valuable to explore whether STol interventions are more effective at a point in young peoples' lives when exams and improving learning are more imminently important (Donohoe et al., 2012).

Much of the previous research exploring STol interventions has focused on underperforming students. Consequently, it would be useful to explore whether interventions can also help to support high achieving pupils, particularly as they might be more concerned about failure (Dweck, 1999; Paunesku et al., 2015). Furthermore, STol might play the greatest role at times of significant transition (Blackwell et al., 2007), such as between year 11 and post-16 education. Emphasis has also been placed on the importance of assessing the longer-term impact of interventions (Donohoe et al., 2012), with research on mindfulness in schools often adopting a 3-month follow-up period (Kuyken et al., 2013; Vickery & Dorjee, 2016).

The use of STol approaches in the UK is becoming increasingly popular and, with much of the previous research being conducted outside of the UK, there is a growing interest in conducting research to determine the value of these interventions in UK schools (Donohoe et al., 2012; Education Endowment Foundation, 2015; Rustin, 2016). Some STol and test anxiety interventions consist of prolonged input over many sessions (Blackwell et al., 2007; Gregor, 2005). However, briefer interventions might be more practical for EPs, schools and pupils. Subsequently, if a brief intervention which aims to support pupils to develop an incremental view of intelligence leads to positive changes in STol and/or reduces test anxiety, this could have practical implications for EPs and the wider education system.

It is hoped that the present study will add to the current literature by answering the research questions outlined in table 1. Hypotheses will be tested at an alpha level of <.05.

Table 1

Research questions and hypotheses

Research question 1. Is there a relationship between pupils' STol and their levels of test anxiety?	
H ₁ :	There is a significant negative relationship between STol and levels of test anxiety.
H ₀ :	There is no significant relationship between STol and levels of test anxiety.
Research question 2. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' STol immediately after the intervention and at a three-month follow-up?	
H ₂ :	Participants in the intervention group report a significant increase in an incremental STol from pre-intervention to post-intervention.
H ₀₀ :	There are no significant differences in STol for participants in the intervention group reported pre- and post-intervention.
H ₃ :	Participants in the intervention group report a significant increase in an incremental STol from pre-intervention to follow-up.
H ₀₀₀ :	There are no significant differences in STol for participants in the intervention group reported pre-intervention and at follow-up.
H ₄ :	There are significant differences between STol scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
H ₀₀₀₀ :	There are no significant differences between STol scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
Research question 3. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' test anxiety immediately after the intervention and at a three-month follow-up?	
H ₅ :	Participants in the intervention group report a significant decrease in levels of test anxiety from pre-intervention to post-intervention.
H ₀₀₀₀₀ :	There are no significant differences in levels of test anxiety for participants in the intervention group reported pre- and post-intervention.
H ₆ :	Participants in the intervention group report a significant decrease in levels of test anxiety from pre-intervention to follow-up.
H ₀₀₀₀₀₀ :	There are no significant differences in levels of test anxiety for participants in the intervention group reported pre-intervention and at follow-up.
H ₇ :	There are significant differences between test anxiety scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
H ₀₀₀₀₀₀₀ :	There are no significant differences between test anxiety scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.

Research question 4. What aspects of the intervention did pupils' find most valuable?

5. References

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Part 2: Major Empirical Paper

1. Abstract

In the United Kingdom (UK) there is an increasing focus on children's performance in tests with many children experiencing test anxiety due to the academic pressure arising from the rigorous testing culture (Putwain, 2008). The current research aimed to investigate whether a brief intervention promoting an incremental view of intelligence could shift sixth-form pupils' self-theories of intelligence (SToI) and reduce their levels of test anxiety. Data was collected from three UK secondary schools using a mixed methods approach. Findings indicate that a brief SToI intervention can lead to statistically significant shifts towards a more incremental perspective however, these changes were not sustained at a three-month follow-up. Furthermore, promoting an incremental perspective does not seem to have a statistically significant impact in reducing pupils' levels of test anxiety. Consequently, interventions aiming to promote an incremental theory of intelligence might not offer a solution to reducing pupils' levels of test anxiety. However, as research highlights that holding an incremental perspective has a range of benefits, educational psychologists (EPs) could offer a valuable contribution by providing similar interventions in schools. Further research is needed to explore how a shift to an incremental perspective can be maintained.

2. Introduction

In the United Kingdom (UK) there is an increasing focus on children's performance in tests with many children experiencing mental health difficulties, including test anxiety, due to the academic pressure arising from the rigorous testing culture (Putwain, 2008a). Elevated levels of test anxiety have also been associated with lower test performance (McDonald, 2001); a pertinent issue when so much importance is placed on test results (Von Der Embse & Witmer, 2014). Consequently, educational professionals, including educational psychologists (EPs), need to find ways to support pupils in managing their test anxiety.

2.1. Test anxiety

2.1.1. Definition of test anxiety

Test anxiety can be considered as a "situation-specific personality trait" (Spielberger & Vagg, 1995, p.13) with affective, cognitive and behavioural components. The degree to which test anxiety is experienced can vary significantly between individuals, with many factors interacting to determine its development (Zeidner, 1998).

2.1.2. Impact of test anxiety

In 2015/2016, test anxiety was raised as an issue for 4204 children in Childline counselling sessions, with children commenting that they felt overwhelmed by the whole exam process (Childline, 2016). The pressure of tests resulted in some pupils feeling depressed, lacking concentration and engaging in self-harm. Consequently, tests might assess pupils' ability to cope with the associated pressure and anxiety rather than their cognitive ability (Zeidner, 2007). The detrimental impact test anxiety can have on pupils' test performance has been highlighted in several studies (Putwain, 2008d; Von Der Embse & Hasson, 2012). However, test anxiety can sometimes facilitate test performance through motivating pupils to prepare for tests (Putwain, 2009), although these findings have been contradicted (Chamberlain, Daly & Spalding, 2011). Consequently, strategies to support pupils need to be considered.

2.1.3. Strategies to reduce test anxiety

A systematic review found a paucity of research exploring the impact of test anxiety interventions with school-aged pupils, particularly using UK samples (Von Der Embse, Barterian & Segool, 2013). Much of the existing research focuses on college and university students therefore, it cannot necessarily be generalised to schools (Ergene, 2003). One practical example of an intervention conducted by an EP found that test anxiety could be reduced through a mixed approach adopting relaxation and cognitive-behavioural principles (Gregor, 2005). However, the research was conducted in only one school therefore replications are required to aid generalisability. Positive outcomes have also been found from internet-based interventions using cognitive-behavioural approaches (Putwain, Chamberlain, Daly & Sadreddini, 2014).

2.1.4. Cognitive strategies to reduce test anxiety

Reduced levels of cognitive distortions have been indicated as one of the greatest protective factors against the negative experiences of test anxiety (Robinson, Alexander & Gradisar, 2009). Therefore, supporting students to cope with the cognitive aspects of pressure from tests might have the greatest benefit (Von Der Embse & Witmer, 2014).

Zeidner's (1998) research on the characteristics of low and high test anxious individuals seem to assimilate with the dichotomies associated with self-theories of intelligence (SToI; Dweck, 1999). High test anxious individuals appear to show characteristics similar to entity theorists and low test anxious individuals display behaviours similar to incremental theorists. Consequently, interventions that have been successful in shifting SToI might also reduce test anxiety.

2.2. Self-theories of intelligence (SToI)

2.2.1. Definition of SToI

Self-theories describe the beliefs individuals hold about themselves and how their minds work (Dweck, 1999). SToI are the most pertinent beliefs within the academic domain, describing the ideas individuals hold about the nature of their intelligence, and are broadly divided into two categories: incremental theory and entity theory.

Individuals who hold an incremental theory “believe that intelligence is a malleable, increasable, controllable quality” (Dweck & Leggett, 1988, p.262); also known as a ‘growth mindset’. Conversely, individuals who hold an entity theory believe that intelligence is a fixed trait that cannot be controlled or changed; also known as a ‘fixed mindset’.

2.2.2. Relationships between STol and behaviour

Self-theories are believed to be stable over time (Dweck, Chiu & Hong, 1995a) however, they can be altered through interventions. Relationships have been shown between STol and effort (De Castella & Byrne, 2015), goal orientation (Elliot & Dweck, 1988), aspirations (Sevincer, Kluge & Oettingen, 2014) and achievement (Blackwell, Trzesniewski & Dweck, 2007), although findings are not always replicated (Education Endowment Foundation, 2015). The longer-term sustainability of changes invoked through STol interventions has also been questioned (Donohoe, Topping & Hannah, 2012).

2.2.3. STol and academic anxiety

Entity theorists are significantly more anxious about schoolwork and doubt their intelligence when they do not achieve high marks (Henderson & Dweck, 1990). Consequently, by addressing pupils’ STol it might be possible to improve academic performance and reduce anxiety. However, the focus on underachieving pupils means that findings might not be generalisable, particularly as highly skilled students might be more concerned about failure (Dweck, 1999).

Individuals who are at risk of ‘stereotype threat’⁷ have shown reductions in anxiety and increases in test performance following interventions targeting STol (Good, Aronson & Inzlicht, 2003). The research focused on female, minority and low-income students, finding positive effects in all groups. Therefore, similar interventions might also have a positive impact in other populations.

⁷ Individuals experience stereotype threats when a widely-held view about a specific group’s intellectual abilities causes extra cognitive and emotional burdens for those in the stereotyped group. Consequently, stereotype threats can cause apprehension about confirming the stereotypical beliefs in their views of themselves and the way they are viewed by others.

2.3. Interventions

Some test anxiety and STol interventions consist of prolonged input over several sessions (Blackwell et al., 2007; Gregor, 2005). However, lengthy interventions might not always be practical. Paunesku et al. (2015) found that one forty-five-minute session of an online STol intervention raised achievement in underperforming students. The study can be merited for including 1594 students from 13 geographically diverse high schools however, the intervention was only completed with underperforming students and predominantly only raised academic attainment in pupils who were at risk of leaving school, raising questions of how relevant these findings are for other groups.

2.4. Rationale

Test anxiety is a significant problem for many pupils in the UK, leading to unfavourable outcomes in academic performance and psychological wellbeing (Denscombe, 2000; Putwain, 2008b). Cognitive factors can play a significant role in test anxiety therefore, interventions based on cognitive theories might be beneficial (Putwain, Connors & Symes, 2010). Interventions which promote an incremental STol have been successful in improving academic outcomes, with relationships between STol and academic anxiety (Good et al, 2003).

Research with sixth-form pupils might be particularly valuable as they represent a group of higher achieving students at a time of significant transition, both factors that are pertinent to the influence of STol (Blackwell et al., 2007; Dweck, 1999). Emphasis has also been placed on the importance of assessing the longer-term impact of interventions (Donohoe et al., 2012).

It is hoped that the present study will add to the current literature by answering the research questions outlined in table 2. Hypotheses will be tested at an alpha level of $<.05$.

Table 2

Research questions and hypotheses

Research question 1. Is there a relationship between pupils' STol and their levels of test anxiety?	
H ₁ :	There is a significant negative relationship between STol and levels of test anxiety.
H ₀ :	There is no significant relationship between STol and levels of test anxiety.
Research question 2. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' STol immediately after the intervention and at a three-month follow-up?	
H ₂ :	Participants in the intervention group report a significant increase in an incremental STol from pre-intervention to post-intervention.
H ₀₀ :	There are no significant differences in STol for participants in the intervention group reported pre- and post-intervention.
H ₃ :	Participants in the intervention group report a significant increase in an incremental STol from pre-intervention to follow-up.
H ₀₀₀ :	There are no significant differences in STol for participants in the intervention group reported pre-intervention and at follow-up.
H ₄ :	There are significant differences between STol scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
H ₀₀₀₀ :	There are no significant differences between STol scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
Research question 3. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' test anxiety immediately after the intervention and at a three-month follow-up?	
H ₅ :	Participants in the intervention group report a significant decrease in levels of test anxiety from pre-intervention to post-intervention.
H ₀₀₀₀₀ :	There are no significant differences in levels of test anxiety for participants in the intervention group reported pre- and post-intervention.
H ₆ :	Participants in the intervention group report a significant decrease in levels of test anxiety from pre-intervention to follow-up.
H ₀₀₀₀₀₀ :	There are no significant differences in levels of test anxiety for participants in the intervention group reported pre-intervention and at follow-up.
H ₇ :	There are significant differences between test anxiety scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.
H ₀₀₀₀₀₀₀ :	There are no significant differences between test anxiety scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.

Research question 4. What aspects of the intervention did pupils' find most valuable?

3. Method

3.1. Research paradigm and design

The research was conducted within a pragmatic paradigm which views the purpose of research as gaining knowledge that can be used to reach a desired outcome (Morgan, 2007). The value of research is judged by how effective it has been in providing solutions for the targeted problems (Maxcy, 2003). Pragmatic research does not seek to find a specific 'truth' but instead explores the difference a certain way of thinking or behaving can make (Maxcy, 2003; Morgan, 2007). Consequently, methods are determined by whether they meet the needs of the research, allowing for quantitative, qualitative or mixed approaches (Johnson & Onwuegbuzie, 2004; Patton, 2002).

The research adopted an independent two-group design whereby participants were given a number and randomly allocated to either the intervention or waiting list condition. The use of a predominately quantitative methodology allowed for relationships between variables to be statistically analysed at different time points and has been the main methodology in previous research on STOI and test anxiety (Paunesku et al., 2015; Von Der Embse et al., 2013). The use of vignettes provided additional qualitative information on pupils' STOI. The evaluation sheet provided pupils' feedback and can be used to inform future interventions.

A concurrent nested design (Creswell, Plano Clark, Gutmann & Hanson, 2003) was implemented whereby quantitative and qualitative data were collected simultaneously. Quantitative data reflects the predominant method guiding the research with qualitative methods being used to help explain the quantitative findings. Data was integrated at the analysis phase (Figure 2).

Figure 2

Visual representation of a concurrent nested design (Creswell et al., 2003)⁸



3.2. Pilot study

Pilot studies should contain 10-20% of the number of participants needed for the research (Baker, 1994). The questionnaires were piloted with 9 pupils (males = 2, females = 7) aged 17.09 years to 18.05 years and the session was piloted with 10 pupils (males = 6, females = 4) aged 17.05 years to 18.07 years from two schools not included in the main research; all pupils gave informed consent (appendix 1). Consequently, the pilot represented approximately 11-12% of the sample size required for statistical significance. The schools for the pilot study were selected through opportunity sampling and were schools that were available and accessible but representative of year 12 students in the main study.

Following the pilot study, more interactive elements were incorporated into the session including, a PowerPoint presentation and actively encouraging pupils to discuss ideas in pairs or small groups. Furthermore, the pilot study highlighted errors in the session evaluation sheet concerning the direction of preferences in the Likert-scales and ascertaining that in the initial phrasing of question 6 ('Is this something that you feel would help all pupils?') the term 'all' should be changed to 'other' in reflection of individual preferences.

⁸ Uppercase letters indicate the major form of data collection (e.g. QUAN) while lowercase letters represent less emphasis (e.g. qual).

3.3. Participants

Pupils aged between 16 and 18 years old who were in year 12 and studying towards their General Certificate of Education Advanced Level (A-Level) qualifications at three schools in England and Wales were invited to take part in the study. The sample consisted of 86 pupils (males = 25, females = 61) aged between 16.10 years and 18.06 years at the start of the research. 46 pupils completed measures at all three time points, which marks an attrition rate of 46.5%. A priori power analysis using G*Power (Faul, Erdfelder, Lang & Buchner, 2007) indicated that 82 participants were needed to calculate a correlation between STOI and test anxiety while a total of 20 participants were needed to assess changes over time, both based on a medium effect size (0.3) and a power of 0.8. Information about the correlation between STOI and test anxiety was measured using the data gathered from time 1 questionnaires. The numbers required for statistical significance were met.

3.4. Measurements

3.4.1. Implicit Theories of Intelligence Scale for Children – Self Form

Pupils' STOI were measured using the Implicit Theories of Intelligence Scale for Children – Self Form (Dweck, 1999). The measure contains 6 questions exploring pupils' views on their own intelligence (appendix 5). Overall scores below three are entity theorists while those scoring above four are incremental theorists. Any scores between three and four are undecided. The scale is reported to have good internal reliability ($\alpha=.94-.98$) and good test re-test reliability ($\alpha=.80$) (Dweck et al., 1995a; Dweck, Chiu & Hong, 1995b). It has good construct and discriminate validity. The use of both entity and incremental items contributes to the measure's validity. The adapted scale by De Castella and Byrne (2015) was considered as an alternative measure as it also has good internal consistency ($\alpha=.90$) however, the wider use of Dweck's original measure within the academic literature allowed for it to be used with greater confidence.

3.4.2. Test Anxiety Inventory

Pupils' test anxiety was measured using Spielberger's (1980) Test Anxiety Inventory. The self-report measure contains 20 questions exploring individuals' attitudes towards tests (appendix 6). Higher total scores indicate higher levels of test anxiety and

separate scores can be obtained for the emotionality and worry sub-scales. The Test Anxiety Inventory was selected as it is the most widely used measure of test anxiety amongst secondary school and university students and uses simplified language to make it more accessible (Chapell et al., 2005; Cizek & Burg, 2006; Spielberger, Gonzalez, Taylor, Algaze & Anton, 1978). It is reported to have good internal reliability ($\alpha=.92-.96$) and good concurrent, construct and discriminative validity (Spielberger, 1980).

3.4.3. Vignettes

Participants were provided with a vignette of a hypothetical scenario and asked to indicate how they would respond to the situation by answering three open-ended questions used in unpublished research by Zhao, Mueller and Dweck, 1998 (cited in Dweck, 1999). The three vignettes (appendix 7) were developed from scenarios by Dweck (1999; 2006) and were counterbalanced across time 1, 2 and 3 to reduce potential order and practise effects (Brooks, 2012).

3.4.4. Session Evaluation Sheet

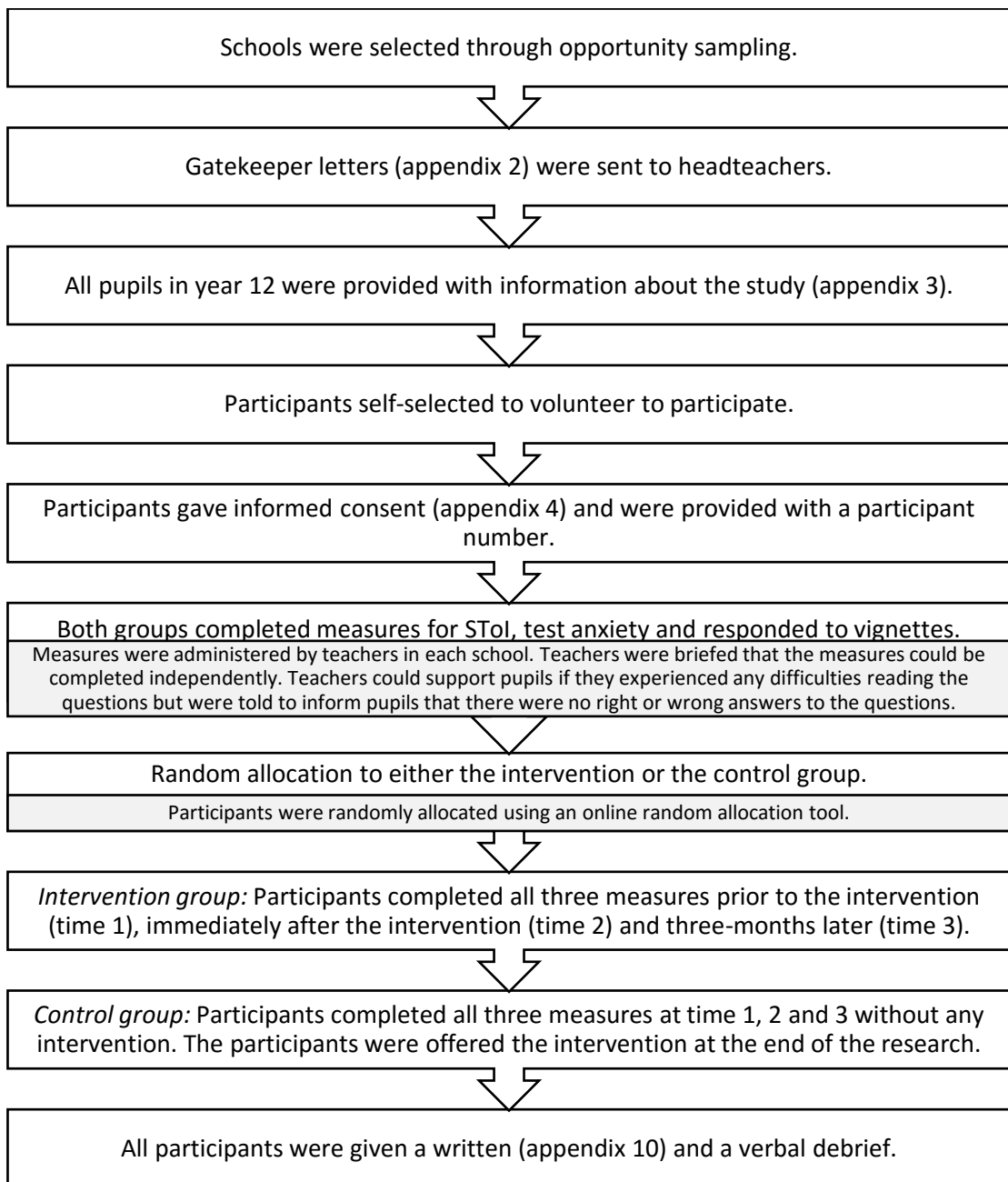
Pupils were asked to evaluate the session using an evaluation sheet developed for the research (appendix 9). Participants completed the evaluation sheet at the end of the session to explore whether they found the session useful and to consider ways it could be improved. Both Likert-scales and open-ended questions were included to provide a mixture of quantifiable information and richer responses reflecting personal views (Denscombe, 2014). The questionnaire was checked by other researchers and piloted with a representative sample; amendments were made where appropriate.

3.5. Procedure

The research procedure can be seen in figure 3.

Figure 3

Research procedure



The intervention (appendix 8) consisted of an hour session implemented by the researcher to ensure that it was delivered consistently to all groups. The session contained various activities aimed at promoting an incremental view of intelligence. The activities and structure of the intervention replicated research by Paunesku et al. (2015) with the addition of a PowerPoint presentation and a video clip to reinforce the ideas. Resources from www.mindsetworks.com were also used. The use of several activities was important as feedback from the pilot study indicated that participants

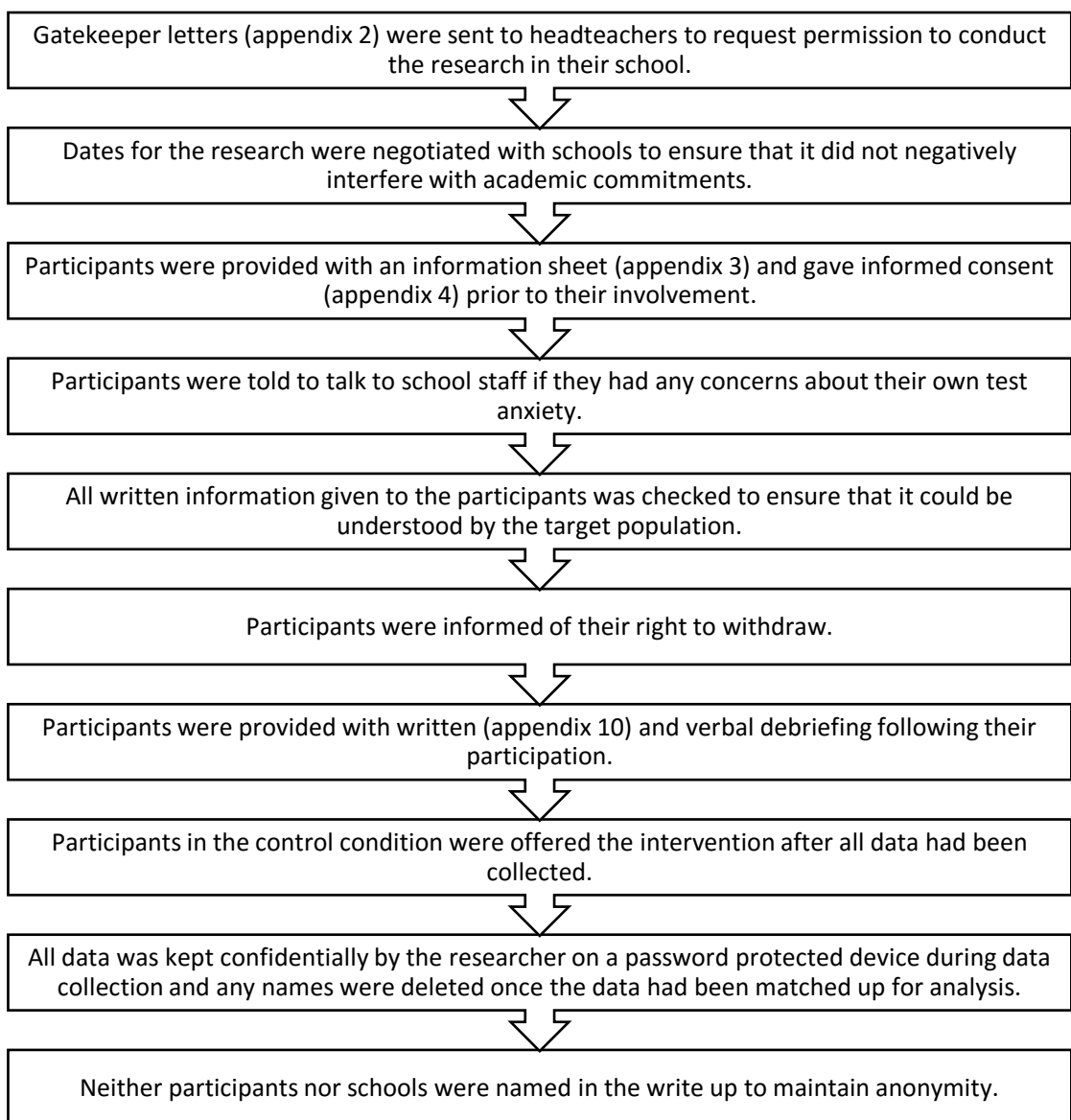
would like more active elements. Active exercises have also been shown as more effective than passive exposure in leading to changes (Walton, 2014).

3.6. Ethical considerations

Ethical approval was gained from the School of Psychology Ethics Committee at Cardiff University prior to the start of the research. The ethical considerations shown in figure 4 were followed.

Figure 4

Ethical considerations



3.7. Data analysis

3.7.1. Questionnaire data

Quantitative data gathered from the Implicit Theories of Intelligence Scale for Children (Dweck, 1999) and the Test Anxiety Inventory (Spielberger, 1980) were analysed using the Statistical Package for Social Sciences (SPSS) Version 23. Incremental items of the Implicit Theories of Intelligence Scale and question 1 of the Test Anxiety Inventory were reverse scored prior to any analysis. Overall scores for the STol measure were calculated by working out each participant's mean score. Responses to the Test Anxiety Inventory were added together to attain a total score for each participant, as well as calculating separate scores for the emotionality and worry sub-scales. Missing data was replaced with the mean scores for that item. For missing data at times 2 and 3, mean scores were calculated from only the participants in the corresponding condition. T-tests indicated that there was a non-significant difference between the scores given by the participants in the intervention and control groups at time 1 for both measures.

Literature was reviewed to determine whether a Pearson's or a Spearman's correlation coefficient would be more appropriate. Although the time 1 data met the parametric assumption of normal distribution, there is debate within the literature as to whether data derived from Likert-scales can be considered as interval (Field, 2009; Jamieson, 2004; Lubke & Muthen, 2006). Given the importance of interval level data for Pearson's correlations to be used reliably (Field, 2009), it was decided that a Spearman's correlation (appendix 12) would be the more reliable analysis for research question 1.

Considerations were also given to the appropriateness of alternatives to the two-way mixed analysis of variance (ANOVA). However, the literature indicates ANOVAs are incredibly robust to violations of the interval data assumption, and can be used for Likert-scale data without any resulting bias (Carifio & Perla, 2007; Glass, Peckham & Sanders, 1972). Consequently, data analysis for research questions 2 and 3 was conducted using two mixed two-way ANOVAs (appendices 14 and 16) as all other necessary assumptions for parametric statistics were met; this included statistical checks for normality, homogeneity of variance and sphericity (appendix 13). The only

exception was that Mauchly's test indicated that the assumption of sphericity had been violated for the test anxiety ANOVA: $\chi^2(2)=13.48$, $p=.001$ therefore, as epsilon (ϵ) is $>.75$, the Huynh-Feldt correction was used. Repeated measures ANOVAs and t-tests were used as post-hoc tests for any significant results (appendices 15 and 17). A Bonferroni correction was applied for post-hoc tests to account for multiple comparisons.

3.7.2. Vignettes

The vignettes were analysed by categorising the comments made into incremental responses, entity responses and other. Further analysis was conducted by recalculating the categories with the 'other' comments removed to focus on STol. The categorisation of the comments was checked by a practicing EP and, in discussion with the researcher, changes were made to the categorisation of certain responses. Data gathered from the vignettes provided additional information for research question 2 (appendix 18).

3.7.3. Session evaluation sheets

Descriptive statistics were used to analyse quantitative data gathered from the session evaluation sheets. Qualitative data was analysed using thematic analysis (Braun & Clarke, 2006) on a semantic level due to the lack of depth provided by the responses. The steps provided by Braun and Clarke (appendix 11) were followed to ensure that the thematic analysis was completed rigorously and to promote consistency. Themes were checked by another researcher. This information was used to answer research question 4 (appendix 19).

4. Results

4.1. Correlational analyses

A one-tailed Spearman's correlation coefficient was conducted using data from all 86 participants who completed the measures at time 1, combining both those in the intervention and the control group (Table 3). Using data gathered at time 1, the analyses revealed non-significant correlations between:

- STol and test anxiety (total), $r_s(84) = -.08$ ($p = .24$)
- STol and test anxiety (emotionality), $r_s(84) = -.02$ ($p = .44$)

Significant correlations were revealed between STol and test anxiety (worry), $r_s(84) = -.20$ ($p = .04$). Consequently, H_0^9 can be partially accepted apart from when the worry sub-scale is analysed separately.

Table 3

Descriptives and correlations between self-theories of intelligence (STol) and test anxiety scores gathered from time 1 data (N=86)

Variable	<i>M</i>	<i>SD</i>	1	2	3	4
1. Self-theories of intelligence (STol)	3.83	0.82	-			
2. Test anxiety (total score)	49.78	12.54	-.079	-		
3. Test anxiety (emotionality subscale)	21.17	5.87	-.016		-	
4. Test anxiety (worry subscale)	18.28	5.16	-.197*			-

* $p < .05$

** $p < .01$

⁹ There is no significant relationship between STol and levels of test anxiety.

4.2. Mixed ANOVAs

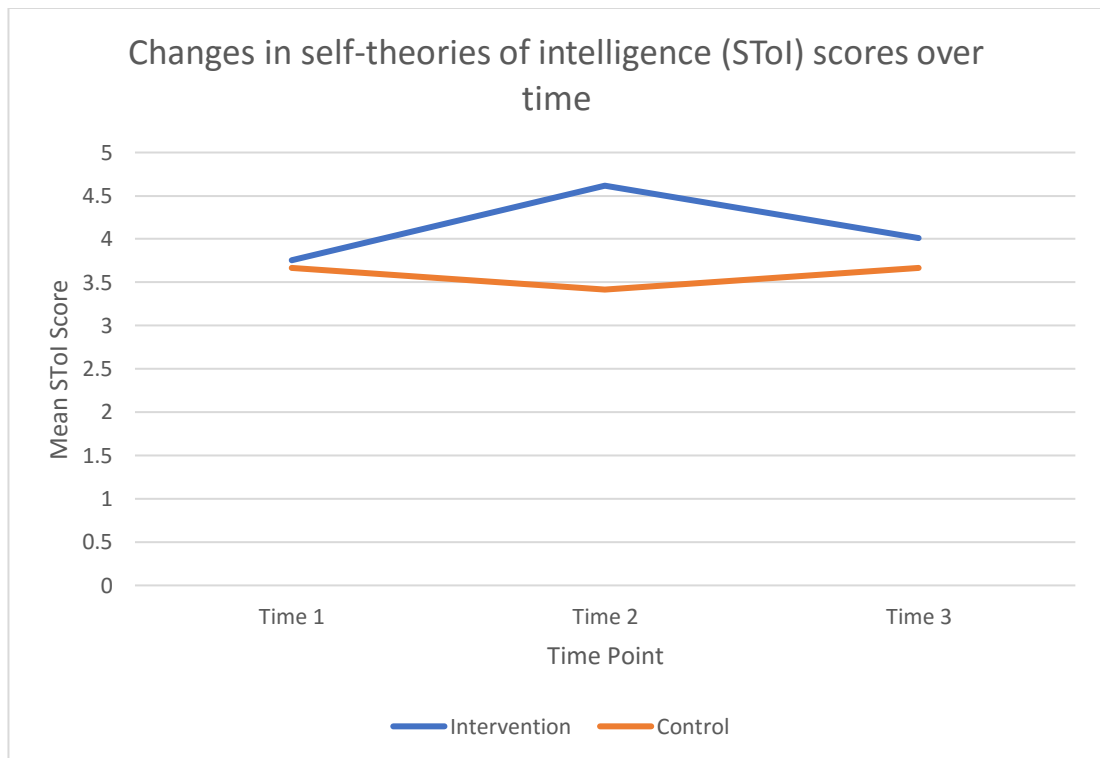
Two mixed ANOVAs were conducted on the influence of two independent variables (group and time) on STol and test anxiety. Group included two levels (intervention and control) and time consisted of three levels (pre-, post- and follow-up).

4.2.1. STol

The mixed ANOVA found a significant main effect for group, $F(1,44)=5.25$, $p=.03$, and a significant main effect of time, $F(2,88)=3.86$, $p=.03$, indicating that there were significant differences between groups and time points. The interaction effect between group and time was significant, $F(2,88)=13.89$, $p<.001$, indicating that the main effects of time and group might not individually explain the overall effect on STol (Figure 5). Therefore, H_{0000} ¹⁰ can be rejected. Two repeated measures ANOVAs were conducted to explore the differences between groups across time.

Figure 5

Graphical representation of changes in self-theories of intelligence (STol) scores across the three time points¹¹



¹⁰ There are no significant differences between STol scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.

¹¹ STol scores below three are deemed to be entity theorists while those scoring above four are incremental theorists. Any participants who fall between three and four are undecided.

4.2.1.1. Post-hoc tests: Intervention group

The repeated measures ANOVA, with a Bonferroni correction applied, indicated a significant effect across time for the intervention group, $F(2,58)=18.39, p<.001$. A paired samples t-test was conducted to compare the differences between time points. The t-test indicated significant differences in the scores for time 1 ($M=3.76, SD=.75$) and time 2 ($M=4.62, SD=.79$); $t(29)=-5.32, p<.001$. Significant results were also found in the scores for time 2 ($M=4.62, SD=.79$) and time 3 ($M=4.01, SD=.89$); $t(29)=4.37, p<.001$. Non-significant differences were found between time 1 ($M=3.76, SD=.75$) and time 3 ($M=4.01, SD=.89$); $t(29)=-1.89, p=.07$. Therefore, H_{00} ¹² can be rejected but H_{000} ¹³ should be accepted.

4.2.1.2. Post-hoc tests: Control group

The repeated measure ANOVA, with a Bonferroni correction applied, indicated a non-significant effect across time for the control group, $F(2,30)=2.57, p=.09$.

4.2.2. Test anxiety

The mixed ANOVA revealed a significant within-subjects main effect of time, $F(1.66, 73.12)=5.39, p=.01$, and a non-significant main effect between groups, $F(1,44)=.69, p=.41$, indicating that there were significant differences across time points but not between groups. T-tests were conducted to further explore differences across time. The interaction effect between time and group was non-significant, $F(1.66, 73.12)=.28, p=.72$ (Figure 6). Therefore, the null hypotheses¹⁴ for research question 3 can be accepted.

¹² There are no significant differences in STOI for participants in the intervention group reported pre- and post-intervention.

¹³ There are no significant differences in STOI for participants in the intervention group reported pre-intervention and at follow-up.

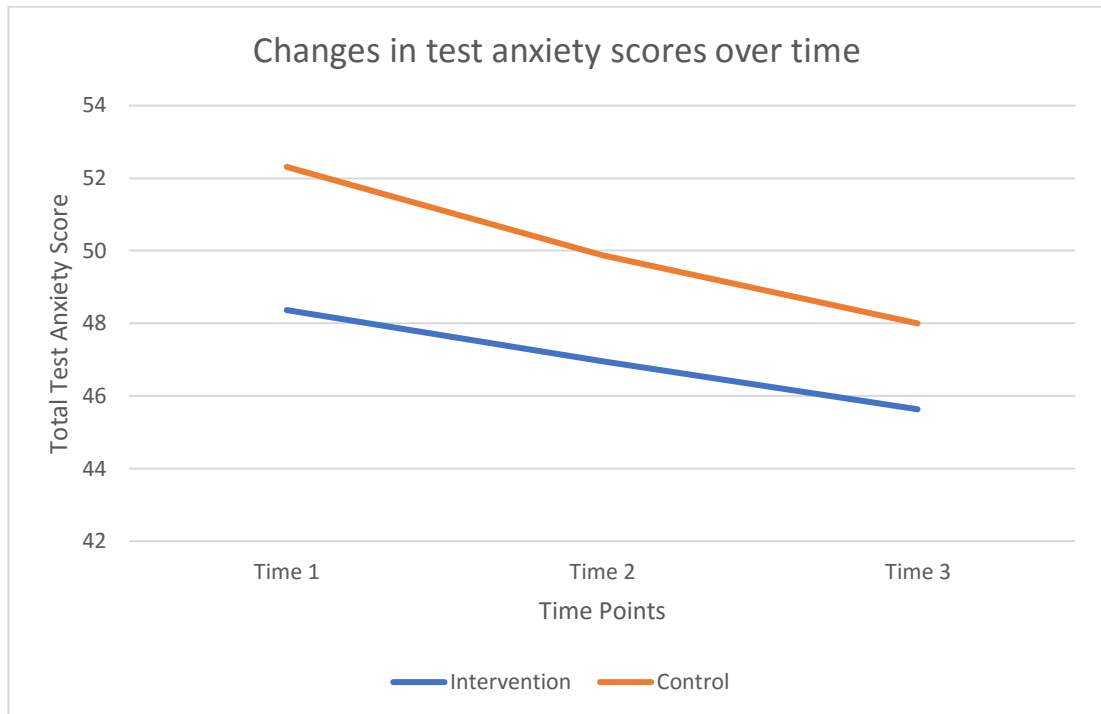
¹⁴ H_{00000} : There are no significant differences in levels of test anxiety for participants in the intervention group reported pre- and post-intervention.

H_{000000} : There are no significant differences in levels of test anxiety for participants in the intervention group reported pre-intervention and at follow-up.

$H_{0000000}$: There are no significant differences between test anxiety scores for participants in the intervention group and the control group at the post-intervention and follow-up time points.

Figure 6

Graphical representation of changes in total test anxiety scores across the three time points¹⁵



4.2.2.1. Post-hoc tests: Changes across time

A paired samples t-test was conducted to compare the differences between time points. Bonferroni correction was applied. The t-test indicated significant differences between time 1 ($M=49.74$, $SD=12.60$) and time 2 ($M=47.98$, $SD=12.42$); $t(45)=2.49$, $p=.02$, and between time 1 ($M=49.74$, $SD=12.60$) and time 3 ($M=46.46$, $SD=12.71$); $t(45)=2.91$, $p=.01$. There was a non-significant difference between time 2 ($M=47.98$, $SD=12.42$) and time 3 ($M=46.46$, $SD=12.71$); $t(45)=1.32$, $p=.19$.

4.3. Vignettes

A considerable proportion of the vignette responses were considered to not reflect incremental or entity perspectives (Table 4). Comments which were deemed to best fit within the 'other' category largely reflected remarks about negative emotions, coping strategies, sources of support and explanations for why they might not have performed well.

¹⁵ Higher total scores indicate higher levels of test anxiety. Total scores range from 20 to 80.

Table 4

Information gathered from the vignettes

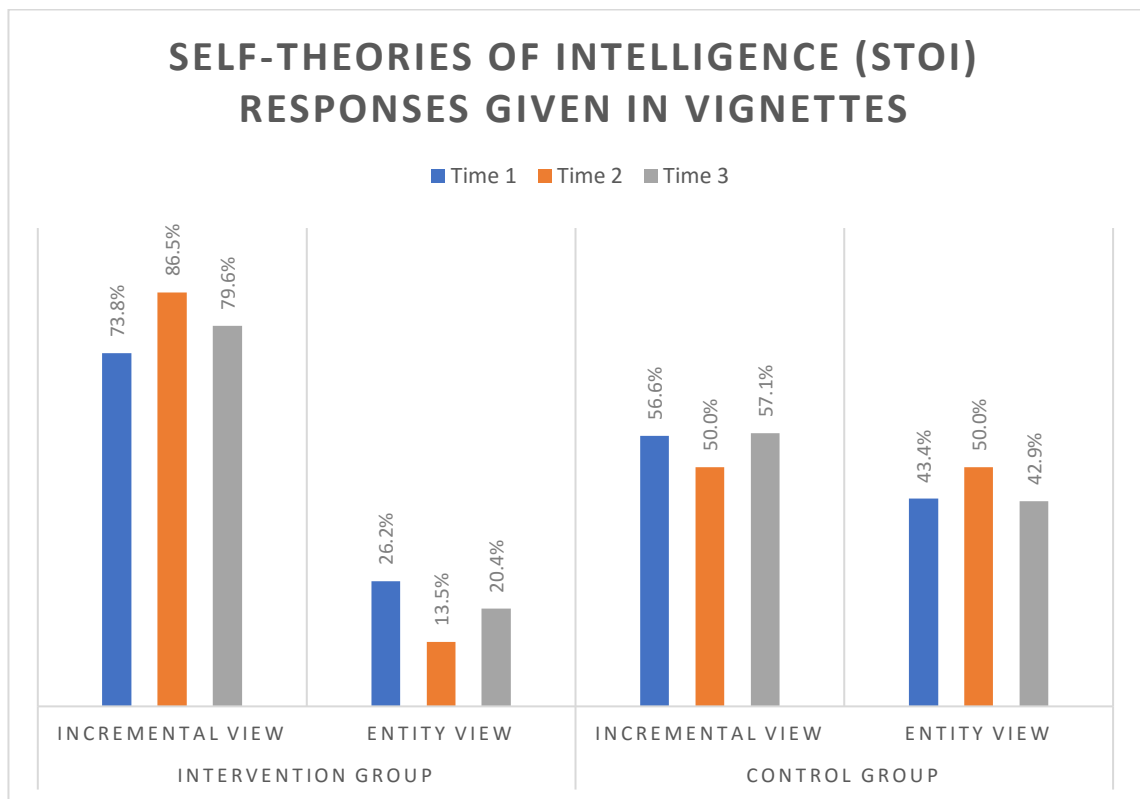
	Intervention group						Control group					
	Time 1		Time 2		Time 3		Time 1		Time 2		Time 3	
	N*	%	N	%	N	%	N	%	N	%	N	%
Incremental view	45	40.2%	64	54.7%	43	47.8%	43	38.1%	25	32.5%	16	35.6%
Entity view	16	14.3%	10	13.5%	11	12.2%	33	29.2%	25	32.5%	12	26.7%
Other	51	45.5%	43	36.8%	36	40%	37	32.7%	27	35.1%	17	37.8%

* N represents the number of comments, not the number of participants.

Figure 7 shows the distribution of data, which has been recalculated with the 'other' comments removed to show the strength of presentation. In the intervention group, there was an increase in incremental responses between time 1 (73.8%) and 2 (86.5%). The number of incremental responses declined again at time 3 (79.6%) but the percentage at time 3 was still higher than the percentage at time 1. Conversely, the control group showed a decline in the number of incremental responses between time 1 (56.6%) and time 2 (50.0%), although the number of incremental responses did increase again at time 3 (57.1%).

Figure 7

Self-theories of intelligence (STOI) responses given in vignettes



4.4. Session evaluation sheets

4.4.1. Quantitative data

The session evaluation sheets indicated that 64.1% of participants found the session to be useful or very useful, 51.3% felt that the session would have probably or definitely been useful for their General Certificate of Secondary Education (GCSE) exams, and 87.2% felt that the session would probably or definitely be useful to other pupils. The video clip (40%) and the article (37.1%) were indicated as the most useful aspects of the session. Prior to the session, 20.5% of participants had some knowledge of STOI with 87.2% indicating that the session had probably or definitely helped them to understand more about STOI. (Table 5).

Table 5

Quantitative data gathered from the session evaluation sheet (N=39)

	N	%
How useful have you found the session?		
Not at all useful	0	0%
Not very useful	0	0%
Somewhat useful	14	35.9%
Useful	18	46.2%
Very useful	7	17.9%
What aspects of the session did you find most useful?		
Video clip	28	40%
Article	26	37.1%
Worksheet	6	8.6%
Summarising the information	10	14.3%
Writing a letter to a struggling student	0	0%
Other	0	0%
Is this something that would have helped you for your GCSEs?		
Definitely not	1	2.6%
Probably not	5	12.8%
Maybe	13	33.3%
Probably	17	43.6%
Definitely	3	7.7%
Is this something that you feel would help other pupils?		
Definitely not	0	0%
Probably not	0	0%
Maybe	5	12.8%
Probably	25	64.1%
Definitely	9	23.1%
Did you know anything about mindsets before coming to this session?		
Yes	8	20.5%
No	31	79.5%
Did you feel that the materials used in the session have helped you to understand more about mindsets?		
Definitely not	0	0%
Probably not	1	2.6%
Maybe	4	10.3%
Probably	15	38.5%
Definitely	19	48.7%

4.4.2. Qualitative data

Three key themes were highlighted in the session evaluation sheets: learning, personal growth and effort (Figure 8). Given the lack of depth in the data, there is a lot of overlap between the themes.

Figure 8

Summary thematic map of final themes

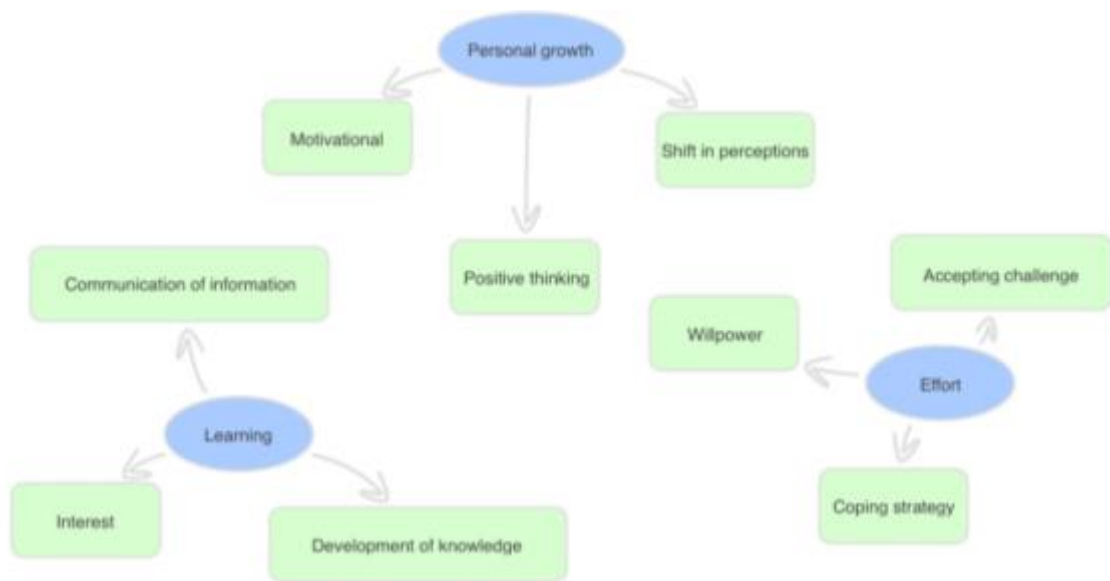
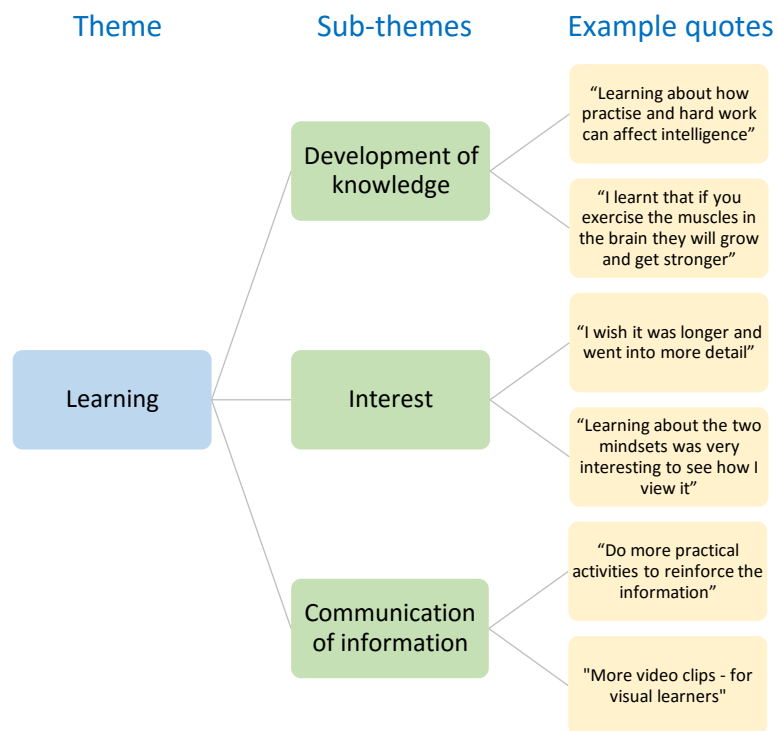


Figure 9

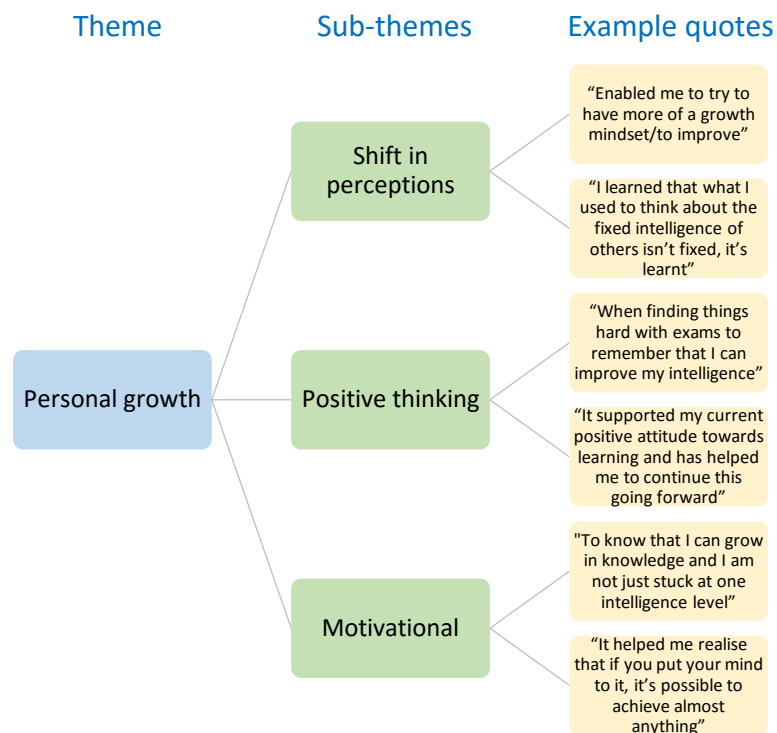
Theme 1: Learning



Participants indicated that the session provided them with a valuable and interesting learning opportunity, reflecting on core concepts and learning points in the session (Figure 9). Comments were made about the communication of the information, highlighting that it would be valuable to have “more interactive activities” and “more talking as groups rather than writing down”. Many of the participants seemed to show a genuine interest in the session, highlighting a desire to have “more time to go into more depth about the information”.

Figure 10

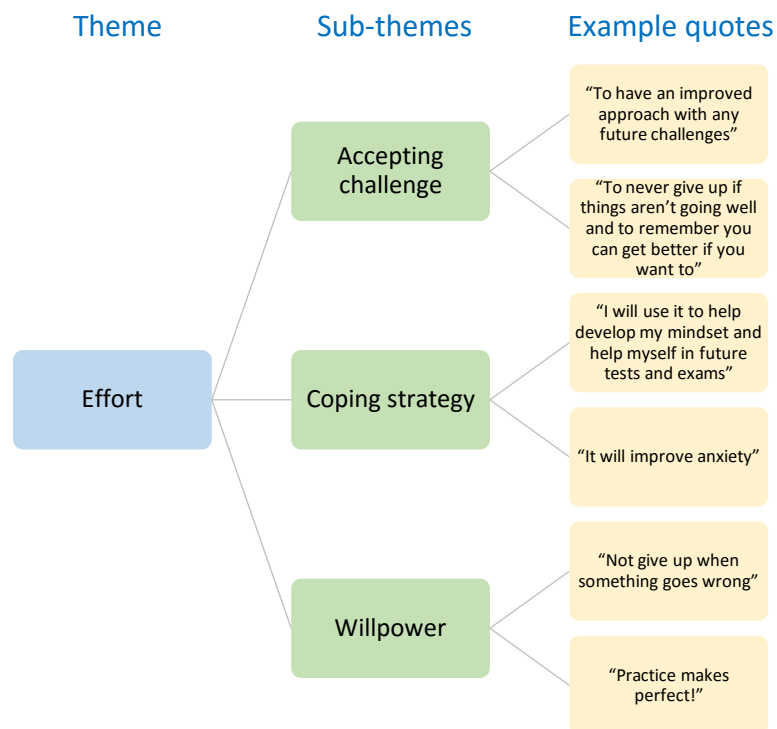
Theme 2: Personal growth



The session appears to have provided participants with opportunities for personal growth (Figure 10). Participants found the session to be motivational, stating that it was “inspirational to know that it is possible to become more intelligent” and “that intelligence can be improved with time and practice”. Several participants commented that they would strive to develop a more incremental perspective in the future.

Figure 11

Theme 3: Effort



To shift their STol, participants commented on the importance of accepting challenges and putting in effort: "It helped me realise that to do well I need to put the effort in" (Figure 11). Participants believed that adopting an incremental perspective could have benefits in supporting them through the exam process and reducing anxiety more generally.

5. Discussion

The research aimed to investigate whether a brief intervention aiming to promote an incremental theory of intelligence could lead to positive changes in sixth-form pupils' STol and levels of test anxiety, both immediately after the intervention and three-months later. The findings are discussed in relation to the research questions and relevant literature.

5.1. Is there a relationship between pupils' STol and their levels of test anxiety?

Statistical analysis indicated a non-significant relationship between STol and overall test anxiety. This is reinforced by findings that the intervention which shifted pupils' STol did not have a significant impact on overall test anxiety scores. Additionally, a non-significant relationship was found between STol and the emotionality component of test anxiety.

However, a significant relationship was revealed between STol and the worry sub-scale of test anxiety. As worry is a key cognitive component of test anxiety (Zeidner, 1998), this could explain the significant relationship given that STol influence cognitive thought processes, such as perceptions of challenge and criticism (Dweck, 1999). Although the correlation is weak, it does provide some initial support for an incremental STol being related to the cognitive components of test anxiety. Consequently, it would be interesting for future research to explore changes in the different components of test anxiety, particularly worry, following interventions.

5.2. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' STol immediately after the intervention and at a three-month follow-up?

The research indicated a statistically significant shift towards a more incremental perspective immediately following the intervention for pupils in the intervention group, supporting previous research which found changes to STol following a brief intervention (Paunesku et al., 2015). However, these changes were not maintained at the three-month follow-up, with a statistically significant shift back towards an entity perspective. Although not statistically significant, a greater incremental view was still held at follow-up compared to pre-intervention.

Findings that changes to STol are not sustained at a three-month follow-up have been supported by Donohoe et al. (2012). Systemic interventions might help to promote more ongoing benefits. Individuals' own feelings of self-evaluation and self-doubt can be influenced by the STol espoused by those around them (Reich & Arkin, 2006), offering an argument for interventions which aim to make systemic changes in attitudes across whole classes or schools.

Implementation science (Blase, Van Dyke, Fixsen & Bailey, 2012) emphasises that sustainability requires time, resources and the necessary infrastructure to maintain change. EPs could support this process through providing training, coaching, support and supervision to the active purveyors. The implementation team should be carefully selected to ensure their commitment to the intervention and that they can act as advocates to advise and guide at the systems level to support wider changes in the school ethos. Longer-term sustainability needs to be considered in the context of changing staff members and organisational changes, therefore senior leadership teams need to be committed to and value the sustainability of the intervention.

Pupils in the control group showed non-significant changes in STol across all three time points, supporting suggestions that without intervention STol are relatively stable over time (Dweck et al., 1995a). The information gathered from the questionnaire data was supported by subjective comments provided in response to the vignettes.

5.3. Does an intervention which aims to promote an incremental view of intelligence lead to changes in pupils' test anxiety immediately after the intervention and at a three-month follow-up?

Findings showed statistically significant differences between test anxiety scores over time however, there were no significant differences between the intervention and control groups. The significant decline in test anxiety scores over time could be due to the time of year in which the data was gathered. The initial data was collected shortly after the national exam period therefore, tests are likely to have been prominent in the pupils' minds. However, when the time 2 and 3 measures were completed prior to the summer holidays and at the start of the new academic year, anxious feelings surrounding exams are likely to feel less pertinent.

Furthermore, the Test Anxiety Inventory (Spielberger, 1980) requires participants to reflect on previous experiences of test situations and, as participants did not have any new tests between the time points, it is likely that they reflected on the same test experiences on all three occasions. Unfortunately, most test anxiety measures rely on reflection of previous tests (e.g. Cassady & Johnson, 2002; Friedman & Bendas-Jacob, 1997). Consequently, there is a need for more qualitative data to assess pupils' perceptions on how the intervention might influence future test experiences or similar research conducted at different times of the year.

The findings contradict previous research which found that STol interventions can be beneficial in reducing test anxiety (Aronson, Fried & Good, 2002; Good et al, 2003). It is possible that there was something specific about using stereotyped groups that led to the positive impact however, these interventions did consist of several sessions. Therefore, perhaps STol interventions need to be more substantial and ongoing to reduce test anxiety.

Research has previously indicated that a mixed approach to intervention is often more successful (Gregor, 2005), perhaps because it provides pupils with several strategies that can be applied dependent on individual preferences. Furthermore, research has highlighted the importance of EPs assessing individual differences when targeting test anxiety and considering the different manifestations of the construct (Putwain, 2008b). Consequently, perhaps interventions need to be more personalised to effectively reduce test anxiety.

5.4. What aspects of the intervention did pupils' find most valuable?

Despite concepts from STol becoming increasingly present in UK schools (Education Endowment Foundation, 2015), over three-quarters of pupils did not know anything about the topic before the session. All pupils scored the session at least somewhat useful with nearly two-thirds indicating that it was useful or very useful, and nearly ninety-percent feeling that the session would be valuable for other pupils. Given the benefits of holding an incremental perspective highlighted throughout the literature (e.g. Blackwell et al., 2007), it seems that there is an interest in these principles being adopted more widely.

Participants found the session to be a valuable learning opportunity, providing them with information to encourage personal growth and embrace challenges, as well as supporting them through the exam process and reducing anxiety. As supported by previous research (Walton, 2014), pupils seemed to enjoy the more interactive elements of the intervention and expressed a desire for a greater number of active exercises.

5.5. Implications for EPs

The session used in this research provides a practical intervention that EPs could realistically use within the time constraints often experienced within the profession (Farrell et al., 2006). It would also be possible for EPs to train school staff to present the information themselves to enable a wider audience to access the intervention. Through giving school staff more ownership, it might help to embed the principles more systemically and therefore prolong the positive impact. EPs could have a valuable role in embedding an incremental perspective in the school ethos with all year groups, and not just in response to anxiety issues, as part of the process of preparing for exams.

Whilst the intervention was not shown to provide an effective strategy to reduce test anxiety, research has indicated a wide range of benefits of holding an incremental STOI therefore, the intervention might still be useful for pupils. Although EPs might need to explore other possible strategies to support pupils in managing test anxiety, it might be that promoting STOI could form a useful part of a wider intervention for targeted groups known to be at risk of test anxiety. Principles included in the intervention could also be applied in individual work and through consultation with schools and parents to highlight how pupils can be supported to develop a more incremental perspective.

5.6. Strengths

The research can be merited for its use of a pilot study and an experimental design with random allocation between an intervention and a waiting list control group. A priori power analysis using G*Power (Faul et al., 2007) was conducted to determine the number of participants needed to provide statistical significance and, as a high level of attrition was accounted for during recruitment, the number of pupils

required for statistical significance was met. The research was conducted in schools from geographically diverse areas and the intervention was implemented by the same researcher in all schools to aid consistency.

5.7. Limitations

Many limitations were highlighted throughout the research. For example, the choice of measurement tools, the participant sample, timings of data collection, the loss of the control group from one of the schools, and trying to conduct a true experimental design in a naturalistic setting.

5.7.1. Measurements

Self-report measures have been highlighted as having various limitations including, social desirability bias, misinterpretation by participants and lack of sensitivity to short-term changes (Duckworth & Yeager, 2015). Furthermore, if the research were to be replicated, it would not be valuable to include vignettes. The analysis was not particularly scientific and was reliant on subjective interpretations made by the researcher and therefore, does not represent the best way to gather meaningful information.

5.7.2. Participants

The research was conducted in three schools with a small number of pupils therefore, these findings cannot necessarily be generalised. Pupils were triple selected as they had to be within a school chosen by the researcher and which chose to participate, and then pupils had to volunteer. Consequently, it is unlikely that the participants are representative of all sixth-form pupils. Furthermore, as sixth-form pupils represent a group of high ability pupils, the findings might not be particularly meaningful to all pupils at other stages of their education given that previous research suggests that individuals' intellectual capacity is likely to influence their STol and approach to tests (Dweck, 1999).

5.8. Future research

Future research should aim to build on the current findings by exploring ways that the benefits of interventions could be maintained longer-term. Principles

highlighted within implementation science (Blase et al., 2012) should be considered to provide useful guidance on supporting the sustainability of the changes. The use of only sixth-form pupils also reflects a restricted age group therefore, it would be interesting to explore the effects of a similar intervention in both younger and older students. Additionally, to develop the current findings, it would be useful to gather more in-depth qualitative data to attain richer information on the more subjective changes that pupils might have experienced as well as how pupils feel they might now respond in future exam situations.

The difficulty with conducting randomly-allocated research with all pupils who volunteer to participate is that those who already held an incremental perspective and/or had low levels of test anxiety at the onset of the research were not likely to make as significant changes therefore, distorting the data. Subsequently, it might be interesting to conduct research using a two-stage process whereby all pupils' STol and levels of test anxiety are assessed and the intervention is conducted only with those who have an entity perspective and/or higher indications of test anxiety as these are the group who have the most to gain from shifting their perceptions.

5.9. Conclusions

The current study has indicated that it is possible to shift pupils' STol to a more incremental perspective, albeit temporarily, following a one-hour intervention. Whilst the research seems to indicate that STol interventions might not offer a valuable solution to reducing pupils' levels of test anxiety, given the benefits of holding an incremental perspective highlighted throughout the literature, EPs providing similar interventions could offer a positive contribution for pupils through a brief session. Future research is needed to explore whether the positive effects can be sustained through EPs working with schools to make systemic changes which encourage the promotion of an incremental view throughout schools' daily practices.

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Part 3: Major Critical Appraisal

The critical appraisal aims to give a reflective account of the research process and explores how the research has contributed to existing knowledge. It provides an opportunity to be both reflexive and reflective about the research process and the role of the research practitioner.

1. Contribution to knowledge

1.1. Origin of the research topic: A personal perspective

The research idea developed through a personal interest in Dweck's (1999; 2006) work following university-based sessions on the topic. As someone who has often experienced stress about assessed academic work, I was interested to discover that Dweck's self-theories of intelligence (STOI) scale identified me as holding an entity perspective, suggesting that I have a fixed self-view of my intelligence as a static characteristic. Given my previous role supporting university students with learning and mental health difficulties, and my current position as a trainee educational psychologist (TEP), I hold a strong view that one failure does not categorise a person and that people can grow and improve through developing better working practices and persisting with effort to reach goals. However, it made me realise that I do not apply these principles and values to my own academic outcomes.

Following the university-based sessions I engaged in further personal reading and was surprised by how much I related to the concepts and the extent to which they quickly improved my anxiety around academic assessments. My personal experiences caused me to think about how, as educational psychologists (EPs), our work in schools often focuses on the pupils who are underachieving or showing significant social, emotional and behavioural difficulties therefore, those pupils who are experiencing difficulties managing their academic anxiety but who might not show overt difficulties can often go unnoticed and without appropriate support.

The power of encouraging an incremental perspective was further emphasised during my first educational psychology service (EPS) placement. During the placement, I applied principles from Dweck's research in my work with a year one pupil and was astounded by how quickly adopting these principles had a significant impact on the child's attitude to school and learning. The work took place over only one session yet

this level of input was enough to cause a shift in his perceptions. As EPs, it is often only possible to provide psychological input over a short period due to time constraints within EPSs therefore, I was interested to see whether it would be possible to have a measureable impact on children's perceptions of their intelligence following a short intervention and whether this might have an impact on attitudes towards tests.

1.2. Exploring gaps in the literature

1.2.1. Test anxiety

Test anxiety is a prevailing problem that is becoming increasingly pertinent in the modern testing culture (Owen-Yeates, 2005; Putwain, 2008; Robinson, Alexander & Gradisar, 2009). In 2015/2016, test anxiety was raised as an issue for 4204 children in Childline counselling sessions, with the pressure of tests resulting in some pupils feeling depressed and engaging in self-harm (Childline, 2016). Childhood mental health difficulties, which can be triggered by test anxiety, are becoming increasingly present in the media and government initiatives (e.g. Department of Health, 2015; Stone, 2017). Despite this, there appeared to be a paucity of research exploring interventions to support pupils to manage their test anxiety, with a systematic review finding only ten studies with school-aged pupils (Von Der Embse, Barterian & Segool, 2013). In particular, the systematic review revealed only one United Kingdom (UK) based study. Although some research has been conducted in this area since the systematic review (e.g. Putwain, Chamberlain, Daly & Sadreddini, 2014) it still appears to be an area which requires development.

Existing research suggested that cognitive distortions play a key role in the development of test anxiety as well as some cognitive interventions being shown to have a beneficial impact (Denscombe, 2000; Putwain, 2009; Von Der Embse et al., 2013). During wider reading, I noticed that the characteristics Zeidner (1998) indicated as common in high test anxious individuals were similar to what Dweck (1999) highlights as being common to those with an entity view of intelligence. Similarly, the characteristics of low test anxious individuals coincided with incremental theorists. Consequently, although I was already considering that interventions to promote an incremental theory might offer a viable strategy to reduce test anxiety, reading Zeidner's (1998) book highlighted that there were some core characteristics that tied the two concepts together. Furthermore, research with specific groups has begun to

show links between STol and improvements in academic anxiety and performance in tests therefore, STol interventions are beginning to be shown as a potential strategy to reduce test anxiety (Aronson, Fried & Good, 2002; Good, Aronson & Inzlicht, 2003). However, research had not been conducted with UK samples and it was felt that sixth-form pupils represent a group who might particularly experience a lot of pressure from high-stakes tests.

1.2.2. STol

A body of research already exists supporting the efficacy of STol interventions and the influence STol can have on various behaviours (Dweck, 1999; Dweck & Leggett, 1988; Robins & Pals, 2002; Yeager & Dweck, 2012). Initially, I thought that a STol intervention would need to occur over several sessions as was seen in other studies (Blackwell, Trzesniewski & Dweck, 2007) however, more recent research had indicated that STol can be shifted from a much briefer, one-off intervention (Paunesku et al., 2015). Consequently, replicating a similar intervention with a UK based sample could have valuable implications for viable work EPs could conduct in schools. Attempts were made to contact Paunesku and his colleagues to ask for copies of their intervention but, as they plan to create a package available for purchase, it was not possible to attain the materials directly. However, it was possible to create a similar intervention for the purposes of my own research.

Additionally, existing research into STol has highlighted that many studies do not assess the longer-term impact of interventions (Blackwell et al., 2007), with some research suggesting that the immediate changes seen after interventions might not be sustained (Donohoe, Topping and Hannah, 2012). Given increases in the use of STol approaches in mainstream schools (Education Endowment Foundation, 2015), UK based research is needed to explore whether investing in STol approaches is a valuable use of schools often limited time and resources, with sustainable outcomes that are longer lasting.

1.2.3. Participant selection

STol might have a more pertinent impact during times of transition (Blackwell et al., 2007). Sixth-form pupils have just experienced a transition from their General Certificate of Secondary Education (GCSE) work to General Certificate of Education

Advanced Level (A-Level) work as well as potentially being due to transition again to university therefore, signifying a group who might benefit from intervention. Regarding the test anxiety element of the research, they are also a group who have had lots of recent test experiences to reflect upon.

Furthermore, much of the existing research into SToI has been conducted with individuals who are underachieving or who are vulnerable to withdrawing from education (Paunesku et al., 2015) therefore, given that Dweck (1999) suggested that high-achievers might be most prone to being concerned about failure and how this would reflect on their sense of self, the impact of interventions in higher achieving students should be explored. Again, sixth-form students provide a good example of higher achievers as all pupils were required to have attained certain GCSE grades to be able to progress to sixth-form. It is important to reflect that the schools and pupils who volunteered to participate might already be those who place a lot of focus on wider personal development and therefore might not be representative of all sixth-form pupils.

1.2.4. Development of the research questions

In view of the existing literature, it would be valuable to explore the relationship between SToI and test anxiety in addition to the impact of a brief intervention on both SToI and test anxiety. It was decided that it would be useful to assess changes using a pre- and post-experimental design as well as investigating the longer-term sustainability of any changes. Furthermore, although the intervention was based on techniques used in existing research, it was felt that gathering participant feedback on the session could help in structuring future interventions.

Upon reflection, whilst research questions 2, 3 and 4 offered a valuable contribution to knowledge, I feel that research question 1¹⁶ does not add much to the research. Furthermore, analysing the correlation between two constructs does not fit particularly well with a pragmatic approach whereby research is deemed to be successful if it helps in seeking solutions to a desired problem (Denscombe, 2008).

¹⁶ Is there a relationship between pupils' SToI and their levels of test anxiety?

1.3. Relevance of research findings to existing knowledge

1.3.1. STol

The research has added to the literature by finding that UK sixth-form pupils' STol can be shifted, albeit temporarily, after a one-off intervention. Findings that the impact of STol interventions do not persist longer-term are supported by existing research (Donohoe et al., 2012). The finding that changes do not last has implications for future research to explore ways that the impact could be prolonged.

1.3.2. Text anxiety

The research highlights that, despite studies into test anxiety indicating a strong cognitive component, brief interventions which aim to promote an incremental STol do not seem to act as a viable strategy to enable statistically significant reductions in pupils' levels of test anxiety. The findings should be considered in line with some of the limitations highlighted in the main empirical paper and below however, currently, it would not seem appropriate to pursue similar interventions to reduce test anxiety. However, it might be useful for future research to develop the existing findings through assessing changes over a longer period in addition to gathering more in-depth qualitative data to explore whether participants might have experienced subjective changes in their attitudes towards tests which were not recognised through quantitative measures. It is interesting to note that the worry component of test anxiety did show a significant relationship with STol therefore, although the correlation was weak, it might be valuable for future research to focus more on this aspect rather than test anxiety overall.

Furthermore, it might have been useful to combine the promotion of an incremental view of intelligence with other approaches and skills development. Previous research has highlighted that a mixed approach is often most useful in reducing levels of test anxiety (Gregor, 2005; Von Der Embse et al., 2013). Therefore, a STol approach might show more benefits if combined with other approaches and/or messages, as indicated in previous research (Good et al., 2003)

1.3.3. Conducting interventions

Standalone STol interventions might not be effective in promoting sustainable, longer-term changes. Furthermore, pupils highlighted that they found the more

interactive elements of the intervention more engaging and sought a multi-sensory approach to learning to embed the information; supporting existing research (Walton, 2014).

1.4. Relevance to EPs' practice

The findings of the research have practical implications for the role of EPs. The research indicated that pupils' STOI can be shifted through a brief one-hour intervention, a commitment that might be practical within EPs' time constraints. However, as the changes were not sustained, EPs should look towards principles within implementation science (Blase, Van Dyke, Fixsen & Bailey, 2012) to explore ways that changes could be maintained longer-term. EPs could have a vital role in enhancing competency drivers through training, coaching and supervising school staff as well as ensuring that the appropriate organisational drivers and leadership commitments are in place.

Although the study did not indicate that promoting an incremental STOI had a positive impact on reducing levels of test anxiety, given the wide range of benefits of holding an incremental perspective highlighted within the literature, the brief intervention might offer a valuable session for EPs to support pupils more generally. One pupil commented during the debrief that his involvement in the research had inspired him to explore the impact of STOI on sports performance for his A-Level physical education project, indicating that the concept seems to have relevance to some pupils in this age group and that through teaching the general principles, pupils can generalise the core ideas to other areas.

Furthermore, EPs could train teachers to provide short, structured interventions themselves, allowing them to deliver the sessions on a wider basis within their schools thus increasing accessibility to a wider range of pupils. EPs could also have a valuable role in educating teachers more generally on the principles and practices embedded within an incremental perspective with a view of encouraging schools to ensure that the concepts become more entrenched in the school ethos. Consequently, it might allow for longer-term benefits to be gained through the ongoing permeation of the ideas into everyday school practices.

1.5. Strengths and limitations

The research can be merited for its use of a pilot study and an experimental design with random allocation between an intervention and a control group. The intervention was also completed by the same researcher in all three schools to aid consistency. However, conducting a true experimental design in a naturalistic setting is difficult as there are so many potentially influential extraneous variables. Pupils in the intervention group might have discussed the session with their peers in the control group, participants might have engaged in further reading following the session, or schools might have been using elements of STol approaches themselves. Although no formal data was collected, anecdotal evidence did suggest that these factors could be an issue. For example, one pupil commented that following the session he had read Dweck's (2006) book to find out more about the topic. Future research could gather further information on potential extraneous variables to check whether they might have influenced the findings. However, despite the difficulties with it not reflecting a true experimental method, it does reflect the practical work that EPs might engage in with schools and therefore has real-life relevance to EPs.

Self-report measures allowed for data to be collected from a larger number of participants than would have been possible through qualitative methods. However, self-report measures can be problematic as participants might provide socially desirable responses to try and please the researcher, or to view themselves in a positive way (Duckworth & Yeager, 2015). Research on personality has indicated that self-reports are best used in collaboration with another tool to increase accuracy (McDonald, 2008). Vignettes were used to provide additional information on STol however, the way the vignettes were analysed was not particularly scientific.

Attempts had been made to contact Dweck and her colleagues to request some of the standardised vignettes she had previously used in her research however, unfortunately, the requests were not responded to. Had it been possible to attain copies of the validated measures, it might have provided more scientific and meaningful data. Instead, it was necessary for me to develop my own vignettes based on the scenarios and questions used in Dweck's previous research (Dweck, 1999; 2006; Zhao, Mueller & Dweck, 1998, cited in Dweck, 1999). Although the vignettes were piloted, the analysis heavily relied on subjective interpretations. To promote more rigorous and consistent analysis, the categorisation of the comments made in the

vignettes was checked and, in discussion with the researcher, some changes were made to the classification of certain responses. Furthermore, the wording of the questions in the vignettes might have primed some of the responses that were received. For example, asking 'how would you feel?' following a failure/negative appraisal is likely to invoke responses reflecting negative emotions. Additionally, asking 'what would you do?' primes participants to give responses reflective of an incremental perspective such as, how you can move forwards and develop.

Upon reflection, it would have been useful to have considered how the vignettes would be analysed prior to using them, perhaps exploring this further at the pilot stage. Once I had reached the analysis phase, it was felt that the data was not in-depth enough for more standardised methods of qualitative analysis or objective enough for complex quantitative analysis. I considered whether the vignettes could be adapted in the future to provide more meaningful information however, it does not feel appropriate. Existing research has highlighted many difficulties in using vignettes to gather information (Hughes & Huby, 2004). Consequently, it would not be recommended that similar tools are used in future research.

Throughout the research, I often considered what the standardised measures were actually measuring. It is possible that when assessing pre- and post- STol measures, after the intervention, participants in the intervention condition might be responding with answers which coincide with the information they have learnt rather than their personal view. Subsequently, the measure might be forming something akin to a test of the knowledge taught rather than a shift in individuals' views. The STol measure does include a statement at the beginning stating that there are no right or wrong answers to try and ameliorate potential bias however, it is unlikely that this completely counteracted the issue.

Furthermore, the Test Anxiety Inventory (Spielberger, 1980) requires participants to reflect on previous test experiences to provide responses. In retrospect, although the measure is used to test pre- and post- changes in several other studies (e.g. Carter et al., 2005), it is possible that when no new test experiences have occurred, participants were just reflecting on the same test experience at all three time points which means that the intervention will not have had an opportunity to impact on their test behaviour. The changes that were seen were consistent in both the intervention and control group and this could be reflective of the difficulties they

experienced in the test environment seeming less pertinent and significant the further away the test was. Consequently, it would be valuable to collect qualitative data which could more specifically focus on asking participants about how they might feel about future tests following the intervention as well as possibly re-administering the Test Anxiety Inventory following a new test experience.

2. Critical account of the research practitioner

2.1. Conducting the literature review

The literature review reflected a very personally challenging aspect of the research process. To reduce how overwhelming the task felt, it was necessary to treat it as four separate sections (introduction, STol, test anxiety and rationale) with each section initially being approached individually. The sections were then brought together into one document to ensure the different aspects linked cohesively.

Conducting extensive research into STol reinforced my existing view that I hold an entity theory of my own intelligence. Holding this view gives insight into my opposition to the challenges faced as part of the thesis process as the high levels of challenge and effort required created a considerable degree of cognitive dissonance and caused me to question my own intelligence and academic capability to complete the required tasks. Having read Dweck's (2006) book around two years ago, and at the time causing shifts in my self-theories, this personal example highlights the importance of continuing reinforcement of STol messages in educational contexts and therefore, has practical implications for my professional practice as an EP.

2.2. Research paradigm

The philosophical underpinnings of any research determine the decisions made throughout the research process therefore, it is important to decide on a philosophical approach from the onset (Darlaston-Jones, 2007). The current study was constructed within a pragmatic paradigm which views research as a way of gaining the knowledge required to reach a desired outcome (Morgan, 2007). Pragmatism is constructed as a practical approach to research rather than pertaining to meet research ideologies, as research is deemed to be effective if it provides solutions for the targeted problems (Denscombe, 2008; Maxcy, 2003). Pragmatism should not be viewed as a haphazard approach to research but should clearly ensure that the study answers the research questions and provides useful answers. Consequently, methods used in pragmatic research are determined by whether they meet the needs of the research (Johnson & Onwuegbuzie, 2004; Patton, 2002). The pragmatic approach has been criticised for its vagueness in terms of who the research is useful for and how usefulness is established.

It is hoped that by reflecting on how the intervention could be useful in the context of the EP role might help to clarify some of these concerns.

A pragmatic paradigm was deemed to be more appropriate than a post-positivist paradigm, which assumes that knowledge should be sought through the strict scientific methods conducted in laboratory studies (Mertens, 2009). Given the number of extraneous variables that could have influenced the findings, it would not be possible for the research to have occurred within a rigid experimental design. Although the research did adopt elements of a randomised control experiment and predominately quantitative data as recommended within a post-positivist approach, it was felt that it would be more valuable to adopt a mixed methods approach to gather the desired information. Mixed methods approaches are highlighted as being particularly useful in terms of triangulating information and allowing richer data to be gathered (Cohen, Manion & Morrison, 2011).

The use of quantitative, qualitative or mixed methods approaches are advocated within a pragmatic paradigm, consequently, the use of different epistemological and ontological standpoints can be adopted for different aspects of the research (Cohen et al., 2011). While I considered dictating my ontological and epistemological standpoints from the onset, this does not fit well with a pragmatic approach that encourages different stances to be used as appropriate.

Broadly speaking, a critical realist ontology and a positivist epistemology were adopted for the quantitative data, an approach which suggests that methods used in natural sciences can be applied in social contexts as objective interpretations provide an ideal for seeking knowledge however, reality can only be understood imperfectly due to flaws in human interpretations and the complexity of human behaviours (Bryman, 2008; Guba & Lincoln, 1994). Conversely, for the qualitative data, a constructionist ontology and an interpretivist epistemology were adopted. The philosophical underpinnings posit that there are multiple, socially constructed realities which are influenced by social interactions and the context in which the research is conducted (Bryman, 2008; Schwandt, 2003). Additionally, the active role of the researcher throughout the research is acknowledged. The importance of considering multiple realities and the context in which research is conducted is important when using vignettes (O'Dell, Crafter, de Abreu & Cline, 2012).

However, it is important to view the ontological and epistemological standpoints as being premised in pragmatism for all aspects of the data collection as is advocated within a mixed methods approach (Cohen et al., 2011). Pragmatism draws upon “positivism and interpretative epistemologies based on the criteria of fitness for purpose and applicability, and regarding ‘reality’ as both objective and socially constructed” (Johnson & Onwuegbuzie, 2004, cited in Cohen et al., 2011, p.23). Consequently, taking an overarching view defined broadly by ontological and epistemological standpoints grounded in pragmatism from the onset was beneficial in helping to fulfil the ‘what works’ approach to research encouraged within a pragmatic paradigm (Cohen et al., 2011).

2.3. Research design and methodological rationale

An independent two-group design was implemented whereby participants were given a number and randomly allocated to either the intervention or control condition. Participants in the control condition were later offered the intervention. The use of pre-test measures allowed for any initial differences between the groups to be analysed (Sapp, 1999). The use of a control condition allowed for differences between groups to be analysed to ensure that changes were not occurring naturally over time. It was important to calculate the number of participants required for statistical significance prior to beginning the research to prevent later problems.

Schools were selected based on my existing contacts. Participants were a biased sample as they were a self-selected group. To an extent, participants were selected on several levels as they firstly had to be within one of the nominated schools who had agreed to participate in the research and then pupils volunteered to engage. Consequently, the schools involved might be those who place a greater emphasis on pupil wellbeing and broader extra-curricular activities and, secondly, the pupils who volunteered might be those with a possible interest in psychology and a desire to seek personal and professional development. Subsequently, participants might not be representative of all sixth-form pupils.

The use of a predominately quantitative methodology allowed for relationships between variables to be statistically analysed at different time points and has been the predominant methodology in previous research on STol and test anxiety (Paunesku et al., 2015; Von Der Embse et al., 2013). Furthermore, given my strong beliefs that there

would be a relationship between STol and test anxiety, a predominately quantitative approach allowed for more objective analysis of data. Additionally, the vignettes, which were counterbalanced across time points, provided further qualitative information on pupils' STol. The evaluation sheet also provided valuable information on pupils' perceptions to help inform future interventions.

Several different test anxiety measures were considered for the research before determining which would be most appropriate. Initially, more generic measures of anxiety were considered including, the Beck Youth Inventory (Beck, Beck & Jolly, 2005) and the State-Trait Anxiety Inventory (Spielberger, 1983), however, given the wealth of available test anxiety measures it seemed logical to use a specific measure. Considerations were made for several different test anxiety measures, including the Friedben Test Anxiety Scale (Friedman & Bendas-Jacob, 1997), the Westside Test Anxiety Scale (Driscoll, 2007) and the Cognitive Test Anxiety Scale (Cassady & Johnson, 2002), before deciding on the Test Anxiety Inventory (Spielberger, 1980). Although several of the measures could have been used in the research, the questions included in Spielberger's Test Anxiety Inventory presented as being more relevant and easier for a wider audience to understand; with research supporting the measure's use of accessible language (Spielberger, Gonzalez, Taylor, Algaze & Anton, 1978). Furthermore, the Test Anxiety Inventory's broad use within the literature as an established measure of test anxiety allowed for it to be used with confidence of its validity and reliability. The measure was also widely used with existing research on test anxiety interventions as a pre- and post- measure (Carter et al., 2005; Yahav & Cohen, 2008) and was highlighted as the most widely used test anxiety measure with adolescents (Chapell et al., 2005).

Consideration was given as to whether to use a Pearson's or a Spearman's correlation. There is debate within the literature as to whether data derived from Likert-scales can be considered as interval as the differences between points on the scale cannot necessarily be considered as equal (Field, 2009; Jamieson, 2004; Lubke & Muthen, 2006). A Spearman's correlation was selected to be cautious however, both types of correlation yielded very similar findings. Regarding further analysis, considerations were given to the appropriateness of alternatives to the two-way mixed analysis of variance (ANOVA). However, the literature indicates that ANOVAs are incredibly robust to violations of the interval data assumption, and can be used if

scales have more than 4 items and the Likert-response contains at least 5 points (Carifio & Perla, 2007; Glass, Peckham & Sanders, 1972). Under these circumstances, there was no resulting bias from using Likert-scales in ANOVAs. Furthermore, the Statistical Package for Social Sciences (SPSS) does not offer a non-parametric equivalent to a mixed ANOVA. Consequently, as all other assumptions were met, two-way mixed ANOVAs were conducted to maintain the quality of the data by sticking to the original, non-ranked data. This made me reflect upon how real world data is complex and full of compromises and the importance of carefully considering all research decisions throughout the process.

2.4. Pilot study

A pilot study was conducted with year 12 and 13 pupils. It was felt that it would be appropriate to use both year groups in the pilot as, although pupils in the main research were in year 12 at the onset, the pupils were in year 13 by the time the final measures were taken. Research suggests that pilot studies should include 10-20% of the target sample size (Baker, 1994), a requirement that was met. The pilot study allowed the researcher to run through the session to see any flaws as well as allowing pupils to provide constructive feedback on any pitfalls with the questionnaires and the session. Conducting a pilot study highlighted the importance of doing so as a research practitioner as it emphasised ways the session could be improved and errors in some of the research documents.

The school in which the pilot study was conducted initially questioned whether it would be suitable to include two pupils with Asperger Syndrome due to concerns that they might not be able to understand some of the more abstract concepts. However, these participants were extremely useful in acknowledging some of the nuances and small errors which were not acknowledged by other participants. Their feedback and questioning of the session and associated documents caused me to question my own practice as a research practitioner and highlighted simple errors that could have caused significant problems had they not been acknowledged at this stage.

2.5. Data collection

Engagement in the research highlighted the importance of considering principles embedded in implementation science (Blase et al., 2012) when conducting

research, particularly having an active purveyor who helps drive the research process. Two of the three schools had a member of staff who was enthusiastically engaged in the research and was willing to offer a lot of support in terms of recruitment and questionnaire completion. In the school without an active purveyor, it was at times very difficult to progress the research and resulted in me losing my control group from that school. Many of the questionnaires were lost as pupils had taken them home to complete and did not return them, a problem that was amplified due to the questionnaires being distributed towards the end of the academic year. From this I learnt the importance of ensuring that the follow-up questionnaires were all completed together in one room at school. Doing so helped me to retain as many participants as possible at the follow-up stage.

As a researcher, it was difficult to devolve control during the data collection aspects of the research. It quickly became apparent that although the research was at the fore of my priorities, it was much less significant for the schools and pupils involved. Consequently, it was important to balance the need to ensure the fostering of a positive working relationship with schools whilst also meeting the demands of the research. Furthermore, at times it was logistically difficult to arrange my thesis around the schools' time pressures and timetables. However, it was important to ensure that the wellbeing and academic priorities of the schools and pupils remained as the top priority therefore, timings were negotiated and flexibly arranged in line with the school calendar.

Given delays in the approval of our thesis proposals, it was not possible to conduct the research within the original timescales. Initially it was hoped that time 1 measures could be completed in April, the intervention and time 2 measures in April/May and the follow-up in July however, by the time ethical approval had been received it was too close to the post-16 examinations for this to be viable. Subsequently, the timescale had to be changed. Ideally, the research would not have been completed in the late summer so the timing became an issue in terms of ensuring appropriate timescales were met. However, conducting the intervention in June/July did mean that I could be certain that it would not have a detrimental effect on pupils' exam preparation. Furthermore, the more conscientious students might be more likely to engage in the research therefore, completing the intervention after the exams might have benefited recruitment as they would not have been worried about missing

out on revision to participate in the research. Additionally, the new timescale allowed for a longer follow-up period which coincided with previous SToI and mindfulness interventions in schools (Donohoe et al., 2012; Kuyken et al., 2013; Vickery & Dorjee, 2016). Consequently, the amended timescale does have some benefits. From this, I have learnt that there is probably no perfect time to conduct research and that there are positives and negatives of any time frame.

To reduce the impact of experimenter bias, it was decided that the researcher would not support the administration of the questionnaires and provide the intervention. The possibility of school staff completing the intervention was considered however, it was felt that to ensure consistent delivery to all groups it was important for this to be completed by the researcher. Furthermore, the researcher would have the additional knowledge to answer any questions. Subsequently, it was decided that the intervention would be implemented by the researcher and the questionnaires would be administered by school staff. As both questionnaires can be completed online, participants would not necessarily need the professional guidance of the researcher during administration.

2.6. Ethical concerns

The ethics committee raised concerns about the accessibility of the documents given to pupils and whether they were set at an appropriate level. I was surprised by the recommendation given that the documents had already been simplified and given the age and academic credentials of the target population. Subsequently, there was a fine balance between simplifying the documents and reducing them to a level that might have seemed patronising to a group of students who were working towards A-Level qualifications. However, as per the ethics committee's recommendations, the documents were broken down using more bullet points and tables to make it visually less overwhelming. The readability age of the documents was also checked to ensure that they were within the appropriate parameters. The documents were piloted to ensure that they could be understood by a representative sample.

The ethics committee were also keen to clarify that the intervention would not place participants at a disadvantage given the proximity of the exam period. To overcome this, dates and times of the data collection and intervention were negotiated with school staff to ensure that the research would not negatively impact

on the pupils involved. Additionally, the session was not promoted to schools as a test anxiety intervention as this would not have been appropriate given that the use of such an approach had not been validated for that purpose. As the session did not show statistically significant benefits in reducing levels of test anxiety, it would not currently be ethical to promote it as a test anxiety intervention.

2.7. Contribution to professional development

Involvement in the research has helped to enhance my research skills and understanding of data analysis. Furthermore, the research highlighted the genuine interest many pupils have in learning more about psychology. As EPs, one of the distinguishing features that separate us from other professionals is our practical application of psychology; a concept which is highlighted within the Constructionist Model of Informed and Reasoned Action (COMOIRA; Gameson & Rhydderch, 2008). Consequently, conducting the research has shown me how the explicit use of psychology with service users could have a valuable role in engaging the interest of those we are supporting to enable change.

The research has also emphasised the importance of encouraging schools to think more broadly about how they use their time with EPs. Some schools place a lot of emphasis on seeking work at an individual level however, I hope to be able to encourage schools to see the potential benefits of group interventions which could have a positive impact for many students, or staff training to enable systemic changes. The study has highlighted the importance of EPs considering principles from implementation science (Blase et al., 2012) to ensure the sustainability of interventions. It is important to highlight the hidden issues that pupils might be experiencing and to find ways to work collaboratively with schools to support those pupils who might not present with the most overtly challenging needs.

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Appendices

Appendix 1: Pilot session consent letter

Thesis Pilot Study

I understand that I am taking part in a pilot study which will involve engaging in a one-off session. Information provided by me during the pilot study will be used to inform any changes that need to be made when the session is used as part of a Doctoral Thesis.

Please sign below to give consent for your information being used for the purposes of the pilot study:

Signed: _____

Date: _____

Thank you again for taking the time to take part in the pilot study and all feedback will be appreciated!

Jessica Draper (Trainee Educational Psychologist at Cardiff University)

Appendix 2: Gatekeeper letter

Dear

I am a Trainee Educational Psychologist studying at Cardiff University. As part of my Doctorate I am carrying out a study which focuses on the relationship between pupils' perceptions of intelligence and attitudes towards tests. Some pupils can become quite anxious about tests and research shows that test anxiety can have a negative impact on pupils, leading to reduced cognitive performance, poorer attainment, psychological distress and even ill health. Research indicates that an increasing number of pupils in the United Kingdom are experiencing anxiety about tests therefore, it is important to conduct research to investigate strategies which might help to support pupils. Little research in this area has been carried out with post-16 pupils and the information gathered from this study might help Educational Psychology Services and schools to have a better understanding of how they can support pupils.

The research will explore whether a brief intervention can support pupils in viewing intelligence as an attribute which can grow and develop and whether such beliefs can help to reduce levels of test anxiety. I am writing to you to enquire whether you would be willing to provide permission for some of your year 12 pupils to participate in this study. This research is being supervised by Andrea Higgins, Professional Tutor on the Doctorate in Educational Psychology Programme at Cardiff University, and ethical approval has been obtained from the School of Psychology Research Ethics Committee.

Pupils will be asked to complete an initial set of questionnaires, which will take approximately 15 minutes. The questionnaires will explore the pupils' perceptions about intelligence as well as their attitudes towards tests. Pupils will be randomly allocated to either an intervention or a control group. Pupils in the intervention group will then attend a teaching session about how intelligence can grow and develop in April/May 2016. Pupils in the control group will receive the same intervention in July 2016; meaning that all pupils who wish to participate will receive the intervention at some point.

The teaching session will be delivered by me, a Trainee Educational Psychologist, and will encourage students to view intelligence as a malleable, increasable and controllable quality as existing research suggests that viewing intelligence in this way can have a positive impact on pupils' goals, beliefs and behaviours. The way individuals view intelligence is otherwise known as their 'mindset', with those who believe intelligence is a quality that can be developed holding a 'growth mindset' while those who believe that intelligence is a fixed trait that cannot grow or be changed holding a 'fixed mindset'.

The session will last no more than 2 hours and will involve showing pupils a brief video clip about mindsets and asking them to read an article which promotes a growth mindset perspective. The pupils will then be asked to use the information from the video clip and article to complete two short writing tasks: a summary of the information they have learnt and a letter to a

struggling student. At the end of the session, the pupils will be asked to complete a sheet evaluating the session and will recomplete the initial questionnaires. All pupils will then recomplete the questionnaires again in July 2016.

The most suitable times for the session to take place will be negotiated with the appropriate members of staff within your school. Participants in both the intervention and the control groups will complete the questionnaires at the same time so that information from both groups can be compared.

If you decide to participate, the study will be open to all pupils in year 12. Participation in the research will be voluntary and individual consent will be gained from pupils who are interested in being involved in the study. Pupils will have the right to withdraw from the research at any time without giving a reason. At the end of the study, all participants will be provided with a debriefing sheet and given the opportunity to ask questions.

All of the data collected from the pupils will be anonymised as soon as possible and the school will not be identified at any point. It is hoped that a number of schools will participate in the research and all data will be reported collectively in the research paper. If you have any additional concerns or would like to discuss this further you can contact me or, my supervisor, Andrea Higgins.

Many thanks in advance for your consideration of this study. I have also enclosed the pupil information sheet which provides further information about the research. Please let me know if you require additional information.

Regards,

Jessica Draper
Trainee Educational Psychologist

Researcher:

Jessica Draper
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 5393
Email: DraperJA@cardiff.ac.uk

Research Supervisor:

Andrea Higgins
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 9003
Email: HigginsA2@cardiff.ac.uk

Appendix 3: Pupil information sheet

School of Psychology, Cardiff University

Information about the research

Thank you for taking the time to read this information and considering taking part in this study. I am currently studying for a Doctorate in Educational Psychology at Cardiff University. As part of my Doctorate, I am carrying out a study which focuses on the relationship between how individuals' view intelligence and their attitudes towards tests. The research will explore whether a brief session can help pupils to understand how their intelligence can grow and develop as well as potentially reducing levels of test anxiety.

Year 12 pupils were selected for this study as it was felt that you will have had lots of test experiences and might also benefit from some of the information provided during the study for future tests.

What happens if I choose to take part?

- You will be provided with a participant number and randomly placed into either group 1 or group 2.
- You will be asked to complete some questionnaires which should only take about 15 minutes. The questionnaires will ask you about your views of intelligence and how you feel about tests. You will not be required to answer any questions that you feel are too personal and can miss out any questions without explaining why.
- Group 1 will then be asked to attend a session lasting no more than 2 hours, which will include a range of activities and the completion of a further set of questionnaires immediately after the session.
- Group 2 will be asked to complete the questionnaires without attending the session.
- Group 1 and 2 will complete the questionnaires again about 6 weeks later.
- Group 2 will then receive the same session as group 1.

What is the session about and what happens in the session?

- The session aims to help you to have a greater understanding of how your intelligence can grow and develop as well as potentially helping you to reduce any anxiety you might have about tests.
- The session contains a range of activities including, video clips and some brief written tasks.

When will this happen?

- All of the questionnaires and sessions will be completed during normal school hours.

	Group 1	Group 2
When will I have to fill out questionnaires? (Each set of questionnaires will take about 15 minutes)	- June 2016 - June/July 2016 - September/October 2016	- June 2016 - June/July 2016 - September/October 2016
When will I go to the session?	- June/July 2016	- September/October 2016

It is up to you whether you want to take part in the study and, if you do decide to, you can choose to stop being in the study at any time without explaining why.

The information gathered during the study will be written up for my Doctoral Thesis and shared with other Doctoral students and my course tutors. I will keep all of the information you give me confidentially and everything will be written up anonymously, so that no-one will be able to trace the information back to you. Once I have collected all of the information I will delete your name from all of my records and the information will only be linked to your random participant number. The anonymised information, containing only the participant number, will be kept indefinitely.

If you require any further information about the study then please contact the researcher, Jessica Draper, or the research supervisor, Andrea Higgins, using the following details:

Jessica Draper
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 5393
Email: DraperJA@cardiff.ac.uk

Andrea Higgins
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 9003
Email: HigginsA2@cardiff.ac.uk

The study has been reviewed and ethically approved the Cardiff University Ethics Committee. If you have any ethical concerns then you are welcome to contact Mark Jones at the Cardiff University Ethics Committee directly:

Secretary of the Ethics Committee
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 0360
Email: psychethics@cardiff.ac.uk

Appendix 4: Pupil consent letter

School of Psychology, Cardiff University

Consent form – Confidential Data

I understand that taking part in this study will involve:

- Attending a session lasting no longer than an hour and a half.
- Completing three sets of questionnaires which should take no longer than 15 minutes each time. I understand that I do not have to respond to all of the questions if I do not wish to and can do this without saying why.

I understand that taking part in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.

I understand that I am free to ask any questions at any time. I am free to withdraw or discuss my concerns with the researcher, Jessica Draper, or the research supervisor, Andrea Higgins, using the following contact details:

Jessica Draper
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 5393
Email: DraperJA@cardiff.ac.uk

Andrea Higgins
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 9003
Email: HigginsA2@cardiff.ac.uk

I understand that the information provided by me will be held confidentially, meaning that only the researcher can trace this information back to me individually. Confidential information will be kept on a password protected device, such as a computer or laptop, until all information has been collected.

I understand that my information will be made anonymous by October 2016 and that after this point no-one will be able to trace my information back to me.

I understand that I can ask for the information I provide to be deleted/destroyed, without giving a reason, at any time up until the data has been made anonymous. I understand that the anonymous information may be kept indefinitely.

I understand that the data will be analysed to develop understanding in this area of research and that no individuals will be identified in the written reports.

I also understand that at the end of the study I will be provided with additional information and feedback about the purpose of the study.

I, _____ (NAME) consent to participate in the study conducted by Jessica Draper, School of Psychology, Cardiff University with the supervision of Andrea Higgins.

Signed:

Date:

Many thanks for your participation

Appendix 5: Self-theories of intelligence questionnaire

Theories of Intelligence

Participant name: _____

Gender (please circle as appropriate): Female Male

Age: _____ years _____ months

Directions

Read each sentence below and then circle the one answer that shows how much you agree with it. There are no right or wrong answers. Please remember that you do not have to answer every question if you do not wish to.

1. You have a certain amount of intelligence, and you really can't do much to change it.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

2. Your intelligence is something about you that you can't change very much.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

3. You can learn new things, but you can't really change your basic intelligence.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

4. No matter who you are, you can change your intelligence a lot.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

5. You can always greatly change how intelligent you are.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

6. No matter how much intelligence you have, you can always change it quite a bit.

1	2	3	4	5	6
Strongly Agree	Agree	Mostly Agree	Mostly Disagree	Disagree	Strongly Disagree

Appendix 6: Test anxiety questionnaire

Test Attitude Inventory

Participant name: _____

Directions

A number of statements which people have used to describe themselves are given on the following page. Read each statement and then circle the appropriate number underneath the statement to indicate how you *generally* feel:

1 = Almost Never, 2 = Sometimes, 3 = Often, 4 = Almost Always

There are no right or wrong answers. Do not spend too much time on one statement but give the answer which seems to describe how you generally feel.

Please remember that you do not have to answer every question if you do not wish to.

1. I feel confident and relaxed while taking tests.

1	2	3	4
Almost Never	Sometimes	Often	Almost Always

3. Thinking about my grade in a course interferes with my work on tests.

1	2	3	4
Almost Never	Sometimes	Often	Almost Always

7. Thoughts of doing poorly interfere with my concentration on tests.

1	2	3	4
Almost Never	Sometimes	Often	Almost Always

12. I wish examinations did not bother me so much.

1	2	3	4
Almost Never	Sometimes	Often	Almost Always

17. During tests I find myself thinking about the consequences of failing.

1	2	3	4
Almost Never	Sometimes	Often	Almost Always

If you feel that test anxiety is a particular issue for you, then please talk to a member of staff within your school (such as your form tutor, head of year or a school counsellor), a doctor or your parents/carers who will be able to advise you on the support available.

For use by Jessica Draper only. Received from Mind Garden, Inc. on April 28, 2016



www.mindgarden.com

To whom it may concern,

This letter is to grant permission for the above named person to use the following copyright material;

Instrument: *Test Anxiety Inventory*

Author: *Charles D. Spielberger, Ph.D.*

Copyright: *1980 Consulting Psychologists Press, Inc.*

for his/her thesis research.

Five sample items from this instrument may be reproduced for inclusion in a proposal, thesis, or dissertation.

The entire instrument may not be included or reproduced at any time in any other published material.

Sincerely,

Vicki Jaimez
Mind Garden, Inc.
www.mindgarden.com

Appendix 7: Vignettes

Participant name: _____

Instructions:

When you read this story, pretend that it really happened to you and try to picture how you would feel and what you would do if it happened.

Responses can be given in the form of single words, short phrases or sentences.

You start a new class at the beginning of the year and you really like the lesson and the teacher. You think you know the lesson pretty well, so you only do a bit of studying for the first test. When you take the test you think you did okay, even though there were some questions you didn't know the answer to. Then the class gets their tests back and you find out you got a very low score.

What would this make you think?

How would you feel?

What would you do?

Participant name: _____

Instructions:

When you read this story, pretend that it really happened to you and try to picture how you would feel and what you would do if it happened.

Responses can be given in the form of single words, short phrases or sentences.

For one of your subjects you have to give a really important presentation on a topic of your choice. Within a couple of lessons, some pupils presented their topics and all of them did very well; their presentations received positive feedback from both the teacher and their classmates. Now it is your turn! You spent the whole night preparing for this presentation and chose your favourite topic. But after your presentation the next morning it turned out that the teacher and your classmates didn't seem to like it very much.

What would this make you think?

How would you feel?

What would you do?

Participant name: _____

Instructions:

When you read this story, pretend that it really happened to you and try to picture how you would feel and what you would do if it happened.

Responses can be given in the form of single words, short phrases or sentences.

One day, you go to a lesson that is really important to you and that you like a lot. The teacher returns the mock exam papers to the class. You usually get Bs but you got a D on this paper. You're very disappointed. That evening on the way back to your home, you miss the bus. Being really frustrated, you call your best friend to share your experience but are sort of brushed off.


What would this make you think?

How would you feel?

What would you do?

Appendix 8: Intervention information

Intervention Session Plan

Task	Content	Materials
Introduction	Introducing the area, what is going to happen in the session and providing pupils with an opportunity to ask questions.	PowerPoint presentation (appendix 8a).
Pupils will read an article	The article outlines how intelligence is a malleable quality which can be grown and developed. The worksheet covers the information given in the article to help to reinforce the key ideas.	'You can grow your intelligence' article and worksheet (appendix 8b). Resources are taken from www.mindsetworks.com .
Pupils will watch a brief video	The clip outlines how having a growth mindset means that you know you can train your brain to get smarter. The human brain acts a lot like a muscle and using your brain can cause it to grow and get heavier. The more you challenge your brain, the more neurons you develop. Meaning that eventually, the things you once found hard become a lot easier.	Video clip: https://www.youtube.com/watch?v=ElVUqv0v1EE 
Summarise information	Pupils will be asked to summarise the information they have heard and read into no more than a paragraph.	Paper and pen
Letter to a struggling student	Pupils will be provided with a hypothetical scenario about a student who is becoming discouraged and beginning to think that he is not clever enough to do well in school. Using the	Paper and pen Scenario (see appendix 8c)

	information from the video clip and article, pupils will be asked to write a short letter to the pupil advising him.	
Session evaluation sheet	Pupils will be asked to fill in an evaluation sheet which reflects on their experiences of the session.	Session evaluation sheet (see appendix 9) Pen
Repeat questionnaires	Pupils will re-complete the mindsets and test anxiety questionnaires as well as providing responses to a vignette.	Implicit Theories of Intelligence Scale for Children – Self Form’ (Dweck, 1999) (see appendix 5) Test Anxiety Inventory (Spielberger, 1980) (see appendix 6) Vignettes (see appendix 7) Pen

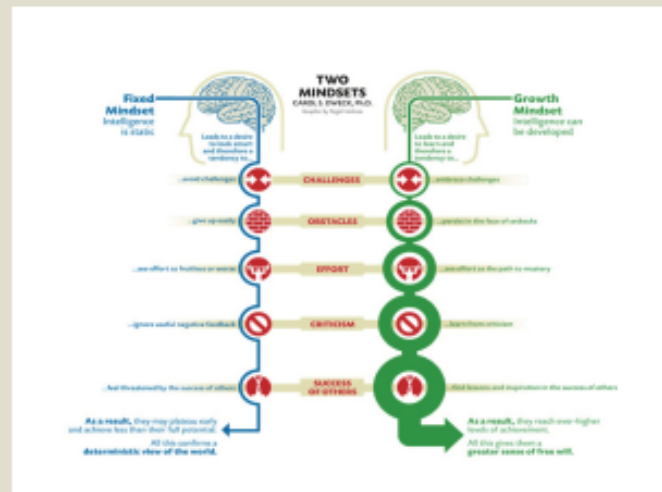
Appendix 8a: PowerPoint presentation



What are mindsets?

- Concept developed by a psychologist called Dr Carol Dweck
- Focuses on the different ways people think their minds work and how they view intelligence
- Mindsets have been shown to influence people's goals, beliefs and behaviours
- Fixed mindset: intelligence is a stable trait that cannot be controlled or changed
- Growth mindset: intelligence is a flexible and increasable quality that can be changed
- Research has shown that people's mindset can be changed and that encouraging people to have a more growth mindset can lead to positive benefits

What are mindsets?



What are mindsets?



Article

- Read the article and use the information to answer the questions at the back of the pack.

You Can Grow Your Intelligence

New Research Shows the Brain Can Be Developed Like a Muscle

Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born either smart, average, or dumb—and stays that way for life.

But new research shows that the brain is more like a muscle—it changes and gets stronger when you use it. And scientists have been able to show just how the brain grows and gets stronger when you learn.

Everyone knows that when you lift weights, your muscles get bigger and you get stronger. A person who can't lift 25 pounds when they start exercising can get strong enough to lift 100 pounds after working out for a long time. That's because the muscles become larger and stronger with exercise. And when you stop exercising, the muscles shrink and you get weaker. That's why people say "use it or lose it!"



© 2000 National Science Foundation

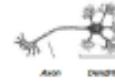
But most people don't know that when they practice and learn new things, parts of their brain change and get larger a lot like muscles do when they exercise.



1

A section of the cerebral cortex

Inside the cortex of the brain are billions of tiny nerve cells, called neurons. The nerve cells have branches connecting them to other cells in a complicated network. Communication between these brain cells is what allows us to think and solve problems.



© 2000 National Science Foundation

A typical nerve cell

When you learn new things, these tiny connections in the brain actually multiply and get stronger. The more that you challenge your mind to learn, the more your brain cells grow. Then, things that you once found very hard or even impossible to do—like speaking a foreign language or doing algebra—seem to become easy. The result is a stronger, smarter brain.

2

HEALTH & SCIENCE News You Can Use

Tasks

Task 1

Write a paragraph summarising what you have learnt about mindsets.

Task 2

Please read the following scenario. Using the information from the video clip and article you have been given today, write a short letter advising the student on what they should do:

Jack is a year 8 pupil who is becoming discouraged and beginning to think that he is not clever enough to do well in school. He has never been as clever as some of his friends and thinks that he will never be able to do as well as them, no matter how hard he tries. He believes that some people are just naturally more intelligent than others and no amount of hard work will change how well you do in school.

Any questions?

Brainology® Intro Unit Activity 3, "Practice It": Reading for Activity Options A and B

You Can Grow Your Intelligence***New Research Shows the Brain Can Be Developed Like a Muscle***

Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born either smart, average, or dumb—and stays that way for life.

But new research shows that the brain is more like a muscle—it changes and gets stronger when you use it. And scientists have been able to show just how the brain grows and gets stronger when you learn.

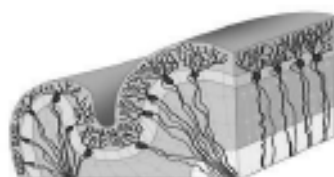
Everyone knows that when you lift weights, your muscles get bigger and you get stronger. A person who can't lift 20 pounds when they start exercising can get strong enough to lift 100 pounds after working out for a long time. That's because the muscles become larger and stronger with exercise. And when you stop exercising, the muscles shrink and you get weaker. That's why people say "Use it or lose it!"



© 2010 Mindset Works

But most people don't know that when they practice and learn new things, parts of their brain change and get larger a lot like muscles do when they exercise.

HEALTH & SCIENCE News You Can Use



1

© Fotoserch

A section of the cerebral cortex

Inside the cortex of the brain are billions of tiny nerve cells, called neurons. The nerve cells have branches connecting them to other cells in a complicated network. Communication between these brain cells is what allows us to think and solve problems.



Axon Dendrites

© Fotoserch

A typical nerve cell

When you learn new things, these tiny connections in the brain actually multiply and get stronger. The more that you challenge your mind to learn, the more your brain cells grow. Then, things that you once found very hard or even impossible to do—like speaking a foreign language or doing algebra—seem to become easy. The result is a stronger, smarter brain.

2

How Do We Know the Brain Can Grow Stronger?

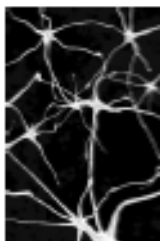
Scientists started thinking that the human brain could develop and change when they studied animals' brains. They found out that animals who lived in a challenging environment, with other animals and toys to play with, were different from animals who lived alone in bare cages.

While the animals who lived alone just ate and slept all the time, the ones who lived with different toys and other animals were always active. They spent a lot of time figuring out how to use the toys and how to get along with the other animals.

Effect of an Enriched Environment



Nerves in brain of animal living in bare cage



Brain of animal living with other animals and toys

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These animals had more connections between the nerve cells in their brains. The connections were bigger and stronger, too. In fact, their whole brains were about 10% heavier than the brains of the animals who lived alone without toys.

The animals who were exercising their brains by playing with toys and each other were also "smarter"—they were better at solving problems and learning new things.

HEALTH & SCIENCE News You Can Use

Even old animals got smarter and developed more connections in their brains when they got the chance to play with new toys and other animals. When scientists put very old animals in the cage with younger animals and new toys to explore, their brains also grew by about 10%!

3

Children's Brain Growth

Another thing that got scientists thinking about the brain growing and changing was babies. Everyone knows that babies are born without being able to talk or understand language. But somehow, almost all babies learn to speak their parents' language in the first few years of life. How do they do this?

The Key to Growing the Brain: Practice!

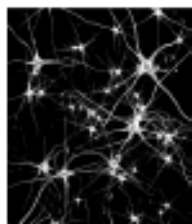
From the first day they are born, babies are hearing people around them talk—all day, every day, to the baby and to each other. They have to try to make sense of these strange sounds and figure out what they mean. In a way, babies are exercising their brains by listening hard.

Later, when they need to tell their parents what they want, they start practicing talking themselves. At first, they just make goo-goo sounds. Then, words start coming. And by the time they are three years old, most can say whole sentences almost perfectly.

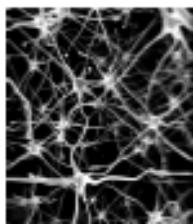
Once children learn a language, they don't forget it. The child's brain has changed—it has actually gotten smarter.

This can happen because learning causes permanent changes in the brain. The babies' brain cells get larger and grow new connections between them. These new, stronger connections make the child's brain stronger and smarter, just like a weightlifter's big muscles make them strong.

4

Growth of neuron connections in a child from birth to 6 years old

At birth



At age 6

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The Real Truth About "Smart" and "Dumb"

No one thinks babies are stupid because they can't talk. They just haven't learned how to yet. But some people will call a person dumb if they can't solve math problems, or spell a word right, or read fast—even though all these things are learned with practice.

At first, no one can read or solve equations. But with practice, they can learn to do it. And the more a person learns, the easier it gets to learn new things—because their brain "muscles" have gotten stronger!

The students everyone thinks as the "smartest" may not have been born any different from anyone else. But before they started school, they may have started to practice reading. They had already started to build up their "reading muscles." Then, in the classroom, everyone said, "That's the smartest student in the class."

They don't realize that any of the other students could learn to do as well if they exercised and practiced reading as much. Remember, all of those other students learned to speak at least one whole language already—something that grownups find very hard to do. They just need to build up their "reading muscles" too.

5

What Can You Do to Get Smarter?

Just like a weightlifter or a basketball player, to be a brain athlete, you have to exercise and practice. By practicing, you make your brain stronger. You also learn skills that let you use your brain in a smarter way—just like a basketball player learns new moves.

But many people miss out on the chance to grow a stronger brain because they think they can't do it, or that it's too hard. It does take work, just like becoming stronger physically or becoming a better ball player does. Sometimes it even hurts! But when you feel yourself get better and stronger, all the work is worth it!

6

HEALTH & SCIENCE News You Can Use

Brainology® Intro Unit Activity 3, "Practice It": Interactive Text Version - Option B

You Can Grow Your Intelligence*New Research Shows the Brain Can Be Developed Like a Muscle*

Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born smart, average, or dumb—and stays that way for life.

What do YOU think??

GUESS WHAT?

New research shows that the brain is more like a muscle—it *changes* and *gets stronger* when you use it!

Everyone knows that when you lift weights regularly, your muscles get bigger and you get stronger.

But what happens to your muscles when you STOP lifting weights?

I think that when you stop lifting weights....



That's why people say, "Use it or lose it!"

Most people don't know that when they practice and learn new things, part of their brain changes, grows, and gets stronger and larger, a lot like muscles do when they exercise.

Scientists have actually been able to show just how the brain grows and gets stronger when you learn.

So here is an analogy: Muscle is to exercise as the brain is to _____.

In other words... Muscles will grow with exercise and the brain will grow with _____.

Here's the secret:

Inside the cortex of the brain are billions of tiny nerve cells called neurons. The nerve cells have branches connecting them to each other in a complicated network. Communication between these brain cells is what allows us to think and solve problems.

When you learn new things, these tiny connections in the brain actually **multiply** and get stronger.

The more that you challenge your mind to learn, the more neuron connections you make in your brain.

If you continue to strengthen these connections, things that you once found very hard to do—like remembering information for a test or doing algebra—seem to become easy. The result is a stronger, smarter brain.

Use the information you have just read to complete the organizer below

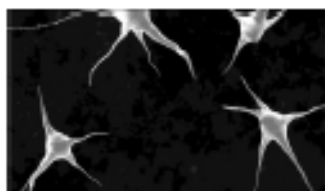
IF...



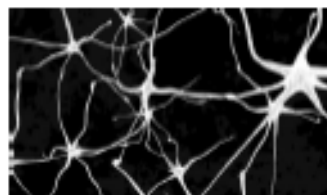
THEN...

The Secret.... continued

Scientists started thinking that the human brain could develop and change when they studied animals' brains. They found out that animals who lived in a challenging environment, with other animals and toys to play with, were different from animals who lived alone in bare cages.



Brain of animal living in bare cage
(non-stimulating environment)



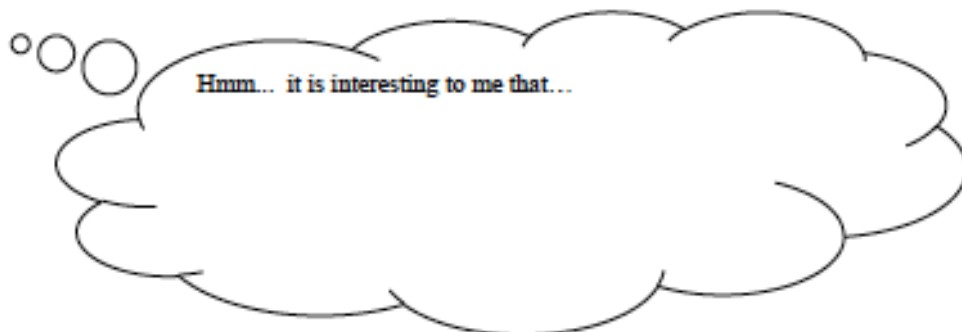
Brain of animal living with other animals and toys
(stimulating environment)

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While the animals that lived alone just ate and slept all the time, the ones that lived with different toys and other animals spent a lot more time figuring out how to use the toys and how to get along with other animals.

The animals who lived in the stimulating environment had more connections between nerve cells in their brains. The connections were bigger and stronger, too. In fact, their whole brains were about 10% heavier than the brains of the animals who lived alone without toys. The animals who were exercising their brains by playing with toys and each other were also “smarter”—they were better at solving problems and learning new things.

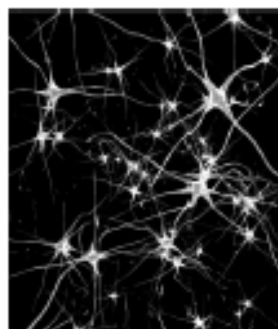
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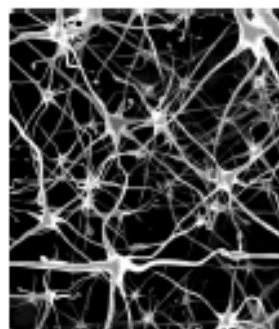
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Another thing that got scientists thinking about the brain growing and changing was babies. Everyone knows that babies are born without being able to talk or understand language. But somehow, almost all babies learn to speak their parents' language in the first few years of life. How do they do this?

Neuron connections in a child from birth to 6 years old



At birth



At age 6

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Do you think this child developed strong language skills by the age of six? Why or why not?

How do you think this child grew all of those neuron connections and pathways?

The Real Truth about "Smart" and "Dumb"

No one thinks babies are stupid because they can't talk. They just haven't learned how to yet. But some people will call a person dumb if they can't solve math problems, or spell a word right, or read fast—even though all these things are learned with practice. At first, no one can read or solve equations. But with practice, they can learn to do it. And the more a person learns, the easier it gets to learn new things—because their brain "muscles" have gotten stronger!



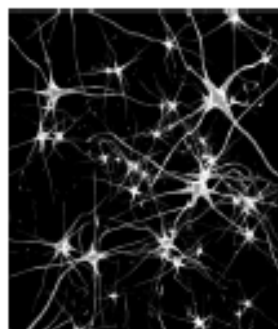
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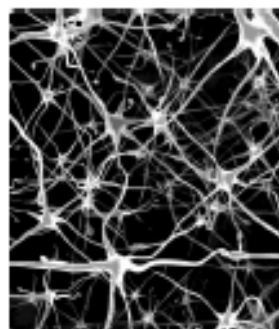
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Appendix 8c: Letter to a struggling student

Please read the following scenario. Using the information from the video clip and article you have been given today, write a short letter advising the student on what they should do.

Jack is a year 8 pupil who is becoming discouraged and beginning to think that he is not clever enough to do well in school. He has never been as clever as some of his friends and thinks that he will never be able to do as well as them, no matter how hard he tries. He believes that some people are just naturally more intelligent than others and no amount of hard work will change how well you do in school.

Appendix 9: Session evaluation sheet

School of Psychology, Cardiff University

Session Evaluation Sheet

1. How useful have you found the session? (Please circle your response below)

1	2	3	4	5
Not at all useful	Not very useful	Somewhat useful	Useful	Very useful

2. In what ways did you find the session useful?

3. Reflecting on the rating you gave in question 1, what could have been different about the session which would have allowed you to rate it one point higher? (e.g. if you rated the session as a 3, what would have needed to be different for you to rate it as a 4?).

4. Which aspects of the intervention did you find most useful? (Please circle all that apply)

Video clip
Article
Worksheet
Summarising the information
Writing a letter to a struggling student
Other (if so, please specify)

5. Is this something that would have helped you for your GCSEs? (Please circle your response below)

1	2	3	4	5
Definitely not	Probably not	Maybe	Probably	Definitely

6. Is this something that you feel would help other pupils? (Please circle your response below)

1	2	3	4	5
Definitely not	Probably not	Maybe	Probably	Definitely

7. Did you know anything about 'mindsets' before coming to this session? (Please circle your response below)

Yes

No

8. Did you feel that the materials used in the session have helped you to understand more about 'mindsets'?

1	2	3	4	5
Definitely not	Probably not	Maybe	Probably	Definitely

9. How will you use the information from the session in the future?

10. Any general comments?

Appendix 10: Pupil debrief

School of Psychology, Cardiff University

Thank you for taking the time to participate in my study.

Self-theories of intelligence, otherwise known as ‘mindsets’, explore the beliefs different individuals hold about the way their mind works and have been shown to influence people’s goals, beliefs and behaviours. In this study I am trying to find out whether there is a relationship between pupils’ self-theories of intelligence and their levels of test anxiety. Additionally, I am exploring whether a brief intervention which aims to promote an incremental view of intelligence can have a positive impact on pupils’ self-theories of intelligence and test anxiety.

Self-theories of intelligence can be broadly divided into two categories: the entity theory (‘fixed mindset’) and the incremental theory (‘growth mindset’). Individuals who hold an incremental theory of intelligence believe that intelligence is a malleable, increasable and controllable quality. On the other hand, individuals who hold an entity theory of intelligence believe that intelligence is a fixed trait that cannot be controlled or changed. The intervention you have received used strategies which aim to promote a more incremental view of intelligence.

Research indicates that an increasing number of pupils in the United Kingdom are experiencing anxiety about tests therefore, it is important to conduct research to investigate strategies which might help to support pupils. Your participation in this research will help to give us a greater understanding of pupils’ self-theories of intelligence and levels of test anxiety.

If you feel that test anxiety is a particular issue for you, then please talk to a member of staff within your school (such as your form tutor, head of year or a school counsellor), a doctor or your parent/carer, who will be able to advise you on the support available.

The information you have provided will be kept confidentially, such that only the researcher can trace this information back to you individually. The data will be anonymised by October 2016 and after this point no-one will be able to trace the information back to you. You can ask for the information you have provided to be withdrawn from the research at any time up until the data has been anonymised. The anonymised information will be shared with other Doctoral students and educational psychologists as part of my research project.

If you have any further questions or wish to withdraw from the study, please contact the researcher, Jessica Draper, or the research supervisor, Andrea Higgins, using the following details:

Jessica Draper

School of Psychology
Cardiff University
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Park Place
Cardiff
CF10 3AT
Tel: 029 2087 5393
Email: DraperJA@cardiff.ac.uk

Andrea Higgins

School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 9003
Email: HigginsA2@cardiff.ac.uk

If you have any ethical concerns then you are welcome to contact Mark Jones at the Cardiff University Ethics Committee directly:

Secretary of the Ethics Committee
School of Psychology
Cardiff University
Tower Building
Park Place
Cardiff
CF10 3AT
Tel: 029 2087 0360
Email: psychethics@cardiff.ac.uk

Appendix 11: Six stages of thematic analysis (adapted from Braun & Clarke, 2006)

Phase	Description of Process
1. Familiarisation with data	Data is transcribed, data is read and re-read and initial ideas are noted down.
2. Generation of initial codes	Interesting aspects are coded across the data in a systematic way. Data which is relevant to each code is collated.
3. Search for themes	Codes are collated into potential themes and all data relevant to each potential theme is gathered.
4. Review of themes	The researchers check if the themes work in relation to the coded extracts and the entire data set generating a thematic map of the analysis.
5. Defining and naming themes	Ongoing analysis is undertaken to refine the specific nature of each theme. Clear names for each theme are generated.
6. Production of themes	A selection of compelling extracts are condensed, final analysis of selected extracts, relating the analysis back to the research question and literature, and producing a report.

Appendix 12: SPSS output for Spearman's Rank Correlation Co-efficient

Correlations			Mindsets AMean	TestA Total	TestAEmotion alityTotal	TestAWor ryTotal
Spear man's rho	MindsetsAMe an	Correl ation Coeffi cient	1.000	-.079	-.016	-.197*
		Sig. (1- tailed)	.	.236	.441	.035
		N	86	86	86	86
	TestATotal	Correl ation Coeffi cient	-.079	1.000	.926**	.842**
		Sig. (1- tailed)	.236	.	.000	.000
		N	86	86	86	86
	TestAEmotion alityTotal	Correl ation Coeffi cient	-.016	.926**	1.000	.636**
		Sig. (1- tailed)	.441	.000	.	.000
		N	86	86	86	86
	TestAWorryTo tal	Correl ation Coeffi cient	-.197*	.842**	.636**	1.000
		Sig. (1- tailed)	.035	.000	.000	.
		N	86	86	86	86

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

Appendix 13: SPSS output showing parametric assumptions for ANOVA

Appendix 13a: Normal distribution

Skewness and kurtosis

Skewness and kurtosis can be converted to z-scores by dividing by their standard error. For data to be viewed as normally distributed, scores should be between -1.96 and 1.96.

$$Z \text{ skewness} = \frac{S - 0}{SE \text{ skewness}}$$

$$Z \text{ kurtosis} = \frac{K - 0}{SE \text{ kurtosis}}$$

Descriptives

Group			Statistic	Std. Error
MindsetsA	Experimental	Mean	3.7556	.13625
		95% Lower Confidence Interval for Mean	3.4769	
		Upper Bound	4.0342	
		5% Trimmed Mean	3.7716	
		Median	3.7500	
		Variance	.557	
		Std. Deviation	.74630	
		Minimum	2.00	
		Maximum	5.17	
		Range	3.17	
		Interquartile Range	1.04	
		Skewness	-.242	.427
		Kurtosis	-.116	.833
	Control	Mean	3.6667	.21624
		95% Lower Confidence Interval for Mean	3.2058	
		Upper Bound	4.1276	
		5% Trimmed Mean	3.6574	
		Median	3.5833	
		Variance	.748	
		Std. Deviation	.86496	
		Minimum	2.33	
		Maximum	5.17	
		Range	2.83	
		Interquartile Range	1.75	

		Skewness	.226	.564
		Kurtosis	-1.216	1.091
MindsetsB	Experimental	Mean	4.6167	.14387
		95% Lower Confidence Bound	4.3224	
		Interval for Upper Mean Bound	4.9109	
		5% Trimmed Mean	4.6389	
		Median	4.7500	
		Variance	.621	
		Std. Deviation	.78802	
		Minimum	2.67	
		Maximum	6.00	
		Range	3.33	
		Interquartile Range	.96	
		Skewness	-.378	.427
		Kurtosis	.115	.833
	Control	Mean	3.4167	.25999
		95% Lower Confidence Bound	2.8625	
		Interval for Upper Mean Bound	3.9708	
		5% Trimmed Mean	3.4815	
		Median	3.6667	
		Variance	1.081	
		Std. Deviation	1.03994	
		Minimum	1.00	
		Maximum	4.67	
		Range	3.67	
		Interquartile Range	1.50	
		Skewness	-.875	.564
		Kurtosis	.313	1.091
MindsetsC	Experimental	Mean	4.0111	.16317
		95% Lower Confidence Bound	3.6774	
		Interval for Upper Mean Bound	4.3448	
		5% Trimmed Mean	3.9784	
		Median	4.0000	
		Variance	.799	
		Std. Deviation	.89371	
		Minimum	2.50	
		Maximum	6.00	

		Range	3.50	
		Interquartile Range	1.25	
		Skewness	.480	.427
		Kurtosis	-.133	.833
Control		Mean	3.6667	.25368
		95% Lower Confidence Bound	3.1260	
		Interval for Upper Mean Bound	4.2074	
		5% Trimmed Mean	3.7130	
		Median	3.6667	
		Variance	1.030	
		Std. Deviation	1.01471	
		Minimum	1.50	
		Maximum	5.00	
		Range	3.50	
		Interquartile Range	1.63	
		Skewness	-.407	.564
		Kurtosis	-.399	1.091
TestATotal	Experimental	Mean	48.3667	2.36715
		95% Lower Confidence Bound	43.5253	
		Interval for Upper Mean Bound	53.2080	
		5% Trimmed Mean	48.0370	
		Median	47.5000	
		Variance	168.102	
		Std. Deviation	12.96543	
		Minimum	27.00	
		Maximum	75.00	
		Range	48.00	
		Interquartile Range	20.50	
		Skewness	.459	.427
		Kurtosis	-.574	.833
	Control	Mean	52.3125	2.96327
		95% Lower Confidence Bound	45.9964	
		Interval for Upper Mean Bound	58.6286	
		5% Trimmed Mean	52.4028	
		Median	55.5000	
		Variance	140.496	
		Std. Deviation	11.85309	

		Minimum	31.00	
		Maximum	72.00	
		Range	41.00	
		Interquartile Range	17.00	
		Skewness	-.084	.564
		Kurtosis	-.459	1.091
TestBTotal	Experimental	Mean	46.9667	2.40521
		95% Lower Confidence Bound Interval for Mean	42.0475	
		Upper Bound	51.8859	
		5% Trimmed Mean	46.8519	
		Median	48.0000	
		Variance	173.551	
		Std. Deviation	13.17386	
		Minimum	22.00	
		Maximum	76.00	
		Range	54.00	
		Interquartile Range	20.50	
		Skewness	.183	.427
		Kurtosis	-.228	.833
	Control	Mean	49.8750	2.75813
		95% Lower Confidence Bound Interval for Mean	43.9962	
		Upper Bound	55.7538	
		5% Trimmed Mean	49.8611	
		Median	51.5000	
		Variance	121.717	
		Std. Deviation	11.03253	
		Minimum	29.00	
		Maximum	71.00	
		Range	42.00	
		Interquartile Range	11.00	
		Skewness	-.431	.564
		Kurtosis	.575	1.091
TestCTotal	Experimental	Mean	45.6333	2.32848
		95% Lower Confidence Bound Interval for Mean	40.8711	
		Upper Bound	50.3956	
		5% Trimmed Mean	45.6481	

			Median	43.0000	
			Variance	162.654	
			Std. Deviation	12.75359	
			Minimum	23.00	
			Maximum	67.00	
			Range	44.00	
			Interquartile Range	23.50	
			Skewness	.080	.427
			Kurtosis	-1.248	.833
Control			Mean	48.0000	3.22102
	95% Confidence Interval for Mean	Lower Bound	41.1345		
		Upper Bound	54.8655		
	5% Trimmed Mean		47.9444		
	Median		48.0000		
	Variance		166.000		
	Std. Deviation		12.88410		
	Minimum		27.00		
	Maximum		70.00		
	Range		43.00		
	Interquartile Range		19.00		
	Skewness		.027	.564	
	Kurtosis		-.642	1.091	

Kolmogorov-Smirnov and Shapiro-Wilk

If the significance value is above 0.05, then the data can be deemed to be normally distributed.

Tests of Normality

Group		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
MindsetsAMean	Experimental	.114	30	.200*	.975	30	.678
	Control	.156	16	.200*	.942	16	.378
MindsetsBMean	Experimental	.125	30	.200*	.975	30	.674
	Control	.157	16	.200*	.926	16	.210
MindsetsCMean	Experimental	.083	30	.200*	.963	30	.361
	Control	.119	16	.200*	.951	16	.503
TestATotal	Experimental	.130	30	.200*	.950	30	.173
	Control	.154	16	.200*	.956	16	.586
TestBTotal	Experimental	.085	30	.200*	.978	30	.763
	Control	.218	16	.040	.935	16	.289
TestCTotal	Experimental	.112	30	.200*	.947	30	.138
	Control	.099	16	.200*	.966	16	.776

Appendix 13b: Homogeneity of variance

Levene's test

Homogeneity of variance can be assumed when significance values are above 0.05.

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
MindsetsAMean	Based on Mean	.835	1	44	.366
	Based on Median	.823	1	44	.369
	Based on Median and with adjusted df	.823	1	43.900	.369
	Based on trimmed mean	.834	1	44	.366
MindsetsBMean	Based on Mean	1.730	1	44	.195
	Based on Median	.981	1	44	.327
	Based on Median and with adjusted df	.981	1	39.438	.328
	Based on trimmed mean	1.452	1	44	.235
MindsetsCMean	Based on Mean	.551	1	44	.462
	Based on Median	.556	1	44	.460
	Based on Median and with adjusted df	.556	1	43.978	.460
	Based on trimmed mean	.543	1	44	.465
TestATotal	Based on Mean	.151	1	44	.700
	Based on Median	.200	1	44	.657
	Based on Median and with adjusted df	.200	1	43.996	.657
	Based on trimmed mean	.146	1	44	.704
TestBTotal	Based on Mean	1.156	1	44	.288
	Based on Median	1.165	1	44	.286
	Based on Median and with adjusted df	1.165	1	43.986	.286
	Based on trimmed mean	1.171	1	44	.285
TestCTotal	Based on Mean	.336	1	44	.565
	Based on Median	.244	1	44	.624
	Based on Median and with adjusted df	.244	1	42.983	.624
	Based on trimmed mean	.334	1	44	.566

Appendix 13c: Sphericity

Mauchly's test

Mauchly's test statistic should be nonsignificant ($p > .05$) for the assumption of sphericity to be met. If sphericity is not met, look at the Greenhouse-Geisser estimate of sphericity (ϵ). When $\epsilon > .75$ the Huynh-Feldt correction should be used. However, if $\epsilon < .75$ then the Greenhouse-Geisser correction is used.

Self-theories of intelligence two-way mixed ANOVA

Mauchly's Test of Sphericity^a

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Mindsets	.974	1.154	2	.562	.974	1.000	.500

Text anxiety two-way mixed ANOVA

Mauchly's Test of Sphericity^a

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TestAnxiety	.731	13.476	2	.001	.788	.831	.500

Appendix 14: SPSS output for STol two-way mixed ANOVA

Within-Subjects Factors

Measure: MEASURE_1

Mindsets	Dependent Variable
1	MindsetsAMean
2	MindsetsBMean
3	MindsetsCMean

Between-Subjects Factors

	Value Label	N
Group 1	Experimental	30
Group 2	Control	16

Descriptive Statistics

	Group	Mean	Std. Deviation	N
MindsetsAMean	Experimental	3.7556	.74630	30
	Control	3.6667	.86496	16
	Total	3.7246	.78112	46
MindsetsBMean	Experimental	4.6167	.78802	30
	Control	3.4167	1.03994	16
	Total	4.1993	1.04623	46
MindsetsCMean	Experimental	4.0111	.89371	30
	Control	3.6667	1.01471	16
	Total	3.8913	.94099	46

**Box's Test of Equality
of Covariance
Matrices^a**

Box's M	13.890
F	2.116
df1	6
df2	6104.329
Sig.	.048

Tests the null hypothesis
that the observed
covariance matrices of
the dependent variables
are equal across
groups.^a

a. Design: Intercept +
Group
Within Subjects Design:
Mindsets

Multivariate Tests^a

Effect		Value	F	Hypothesis df	Error df	Sig.
Mindsets	Pillai's Trace	.131	3.249 ^b	2.000	43.000	.049
	Wilks' Lambda	.869	3.249 ^b	2.000	43.000	.049
	Hotelling's Trace	.151	3.249 ^b	2.000	43.000	.049
	Roy's Largest Root	.151	3.249 ^b	2.000	43.000	.049
Mindsets * Group	Pillai's Trace	.354	11.787 ^b	2.000	43.000	.000
	Wilks' Lambda	.646	11.787 ^b	2.000	43.000	.000
	Hotelling's Trace	.548	11.787 ^b	2.000	43.000	.000
	Roy's Largest Root	.548	11.787 ^b	2.000	43.000	.000

a. Design: Intercept + Group
Within Subjects Design: Mindsets
b. Exact statistic

Mauchly's Test of Sphericity^a

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Mindsets	.974	1.154	2	.562	.974	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Group

Within Subjects Design: Mindsets

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Mindsets	Sphericity Assumed	1.966	2	.983	3.862	.025
	Greenhouse-Geisser	1.966	1.948	1.009	3.862	.026
	Huynh-Feldt	1.966	2.000	.983	3.862	.025
	Lower-bound	1.966	1.000	1.966	3.862	.056
Mindsets * Group	Sphericity Assumed	7.067	2	3.534	13.886	.000
	Greenhouse-Geisser	7.067	1.948	3.627	13.886	.000
	Huynh-Feldt	7.067	2.000	3.534	13.886	.000
	Lower-bound	7.067	1.000	7.067	13.886	.001
Error(Mindsets)	Sphericity Assumed	22.394	88	.254		
	Greenhouse-Geisser	22.394	85.730	.261		
	Huynh-Feldt	22.394	88.000	.254		
	Lower-bound	22.394	44.000	.509		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Mindsets	Type III Sum of Squares	df	Mean Square	F	Sig.
Mindsets	Linear	.341	1	.341	1.517	.225
	Quadratic	1.625	1	1.625	5.714	.021
Mindsets * Group	Linear	.341	1	.341	1.517	.225
	Quadratic	6.727	1	6.727	23.653	.000
Error(Mindsets)	Linear	9.881	44	.225		
	Quadratic	12.513	44	.284		

Levene's Test of Equality of Error Variances^a

	F	df1	df2	Sig.
MindsetsAMean	.835	1	44	.366
MindsetsBMean	1.730	1	44	.195
MindsetsCMean	.551	1	44	.462

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.^a

a. Design: Intercept + Group

Within Subjects Design: Mindsets

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1861.395	1	1861.395	1052.479	.000
Group	9.279	1	9.279	5.247	.027
Error	77.818	44	1.769		

Estimated Marginal Means

1. Group

Estimates

Measure: MEASURE_1

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	4.128	.140	3.845	4.410
Control	3.583	.192	3.196	3.970

Pairwise Comparisons

Measure: MEASURE_1

(I) Group (J) Group		Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Experimental	Control	.544*	.238	.027	.065	1.023
Control	Experimental	-.544*	.238	.027	-1.023	-.065

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	3.093	1	3.093	5.247	.027
Error	25.939	44	.590		

The F tests the effect of Group . This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. Mindsets

Estimates

Measure: MEASURE_1

Mindsets	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.711	.122	3.465	3.957
2	4.017	.137	3.742	4.292
3	3.839	.145	3.547	4.131

Pairwise Comparisons

Measure: MEASURE_1

(I) Mindsets	(J) Mindsets	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	-.306*	.119	.014	-.545	-.066
	3	-.128	.104	.225	-.337	.081
2	1	.306*	.119	.014	.066	.545
	3	.178	.108	.108	-.040	.396
3	1	.128	.104	.225	-.081	.337
	2	-.178	.108	.108	-.396	.040

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Least Significant Difference
(equivalent to no adjustments).

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.131	3.249 ^a	2.000	43.000	.049
Wilks' lambda	.869	3.249 ^a	2.000	43.000	.049
Hotelling's trace	.151	3.249 ^a	2.000	43.000	.049
Roy's largest root	.151	3.249 ^a	2.000	43.000	.049

Each F tests the multivariate effect of Mindsets. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

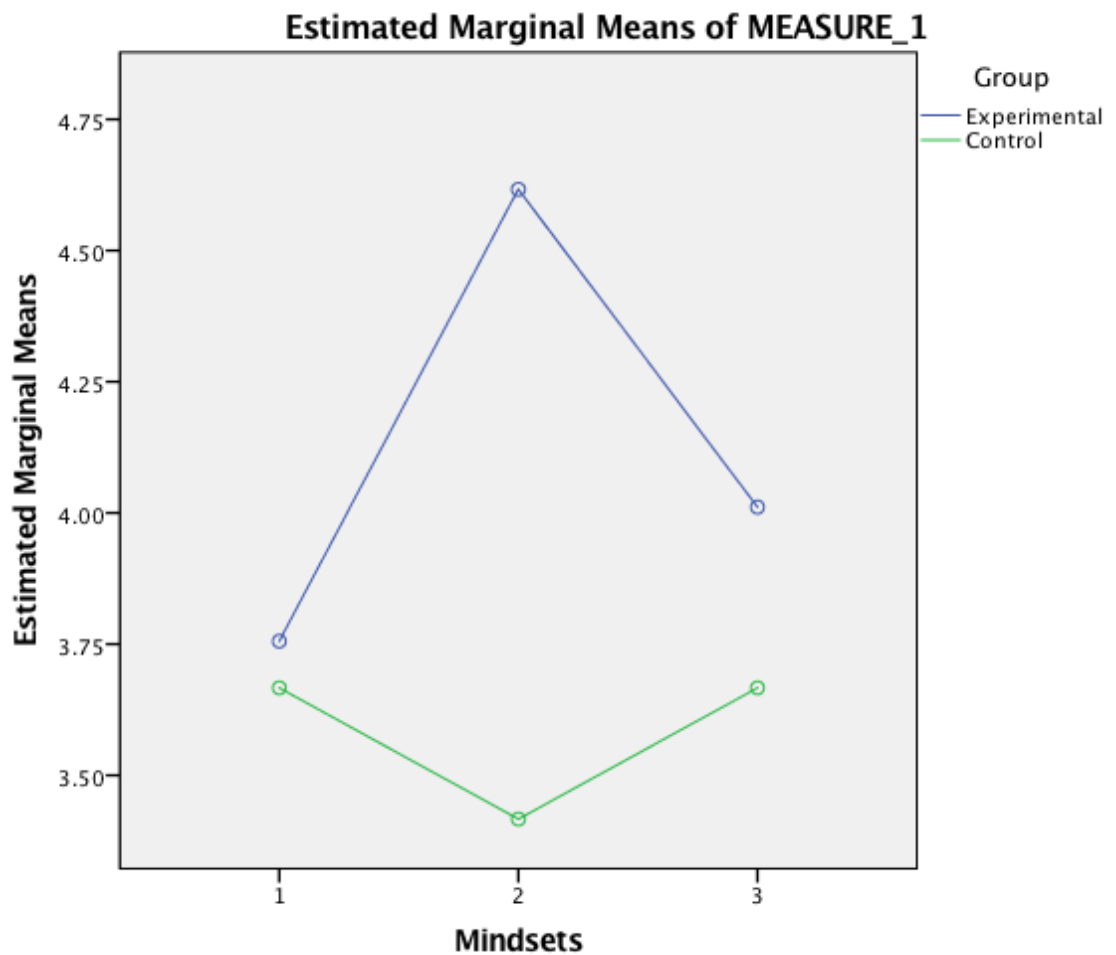
a. Exact statistic

3. Group * Mindsets

Measure: MEASURE_1

Group	Mindsets	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	1	3.756	.144	3.465	4.046
	2	4.617	.161	4.292	4.941
	3	4.011	.171	3.666	4.356
Control	1	3.667	.197	3.269	4.064
	2	3.417	.221	2.972	3.861
	3	3.667	.234	3.195	4.139

Profile Plots



Appendix 15: SPSS output for STol post-hoc tests

Repeated measures ANOVA

Within-Subjects Factors

Measure: MEASURE_1

Mindsets	Dependent Variable
1	MindsetsAMean
2	MindsetsBMean
3	MindsetsCMean

Descriptive Statistics

Group		Mean	Std. Deviation	N
Experimental	MindsetsAMean	3.7556	.74630	30
	MindsetsBMean	4.6167	.78802	30
	MindsetsCMean	4.0111	.89371	30
Control	MindsetsAMean	3.6667	.86496	16
	MindsetsBMean	3.4167	1.03994	16
	MindsetsCMean	3.6667	1.01471	16

Multivariate Tests^a

Group	Effect	Value	F	Hypothesis df	Error df	Sig.
Experimental	Mindsets Pillai's Trace	.512	14.670 ^b	2.000	28.000	.000
	Wilks' Lambda	.488	14.670 ^b	2.000	28.000	.000
	Hotelling's Trace	1.048	14.670 ^b	2.000	28.000	.000
	Roy's Largest Root	1.048	14.670 ^b	2.000	28.000	.000
Control	Mindsets Pillai's Trace	.264	2.508 ^b	2.000	14.000	.117
	Wilks' Lambda	.736	2.508 ^b	2.000	14.000	.117
	Hotelling's Trace	.358	2.508 ^b	2.000	14.000	.117

Roy's Largest Root	.358	2.508 ^b	2.000	14.000	.117
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a. Design: Intercept

Within Subjects Design: Mindsets

b. Exact statistic

Group	Within Subjects Effect	Mauchly's W	Approx. Chi- Square	df	Sig.	Epsilon ^b	
						Greenhouse- Geisser	Huynh- Feldt
Experimental	Mindsets	.945	1.593	2	.451	.948	1.000
Control	Mindsets	.930	1.023	2	.600	.934	1.000

Mauchly's Test of Sphericity^a

Measure: MEASURE_1

Group	Within Subjects Effect	Epsilon
		Lower-bound
Experimental	Mindsets	.500
Control	Mindsets	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept

Within Subjects Design: Mindsets

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Group	Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Experimental	Mindsets	Sphericity Assumed	11.735	2	5.868	18.390	.000
		Greenhouse-Geisser	11.735	1.895	6.192	18.390	.000
		Huynh-Feldt	11.735	2.000	5.868	18.390	.000
		Lower-bound	11.735	1.000	11.735	18.390	.000
	Error(Mindsets)	Sphericity Assumed	18.506	58	.319		
		Greenhouse-Geisser	18.506	54.961	.337		
		Huynh-Feldt	18.506	58.000	.319		
		Lower-bound	18.506	29.000	.638		
Control	Mindsets	Sphericity Assumed	.667	2	.333	2.571	.093
		Greenhouse-Geisser	.667	1.868	.357	2.571	.098
		Huynh-Feldt	.667	2.000	.333	2.571	.093
		Lower-bound	.667	1.000	.667	2.571	.130
	Error(Mindsets)	Sphericity Assumed	3.889	30	.130		
		Greenhouse-Geisser	3.889	28.025	.139		
		Huynh-Feldt	3.889	30.000	.130		
		Lower-bound	3.889	15.000	.259		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Group	Source	Mindsets	Type III Sum of Squares	df	Mean Square	F	Sig.
Experimental	Mindsets	Linear	.980	1	.980	3.554	.069
		Quadratic	10.756	1	10.756	29.669	.000
	Error(Mindsets)	Linear	7.993	29	.276		
		Quadratic	10.513	29	.363		
Control	Mindsets	Linear	.000	1	.000	.000	1.000
		Quadratic	.667	1	.667	5.000	.041
	Error(Mindsets)	Linear	1.889	15	.126		
		Quadratic	2.000	15	.133		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Group	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Experimental	Intercept	1533.469	1	1533.469	1145.630	.000
	Error	38.818	29	1.339		
Control	Intercept	616.333	1	616.333	237.051	.000
	Error	39.000	15	2.600		

Estimated Marginal Means Mindsets

Estimates

Measure: MEASURE_1

Group	Mindsets	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	1	3.756	.136	3.477	4.034
	2	4.617	.144	4.322	4.911
	3	4.011	.163	3.677	4.345
Control	1	3.667	.216	3.206	4.128
	2	3.417	.260	2.863	3.971
	3	3.667	.254	3.126	4.207

Pairwise Comparisons

Measure: MEASURE_1

Group	(I) Mindsets	(J) Mindsets	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
						Lower Bound	Upper Bound
Experimental	1	2	-.861 [*]	.162	.000	-1.273	-.449
		3	-.256	.136	.208	-.600	.089
	2	1	.861 [*]	.162	.000	.449	1.273
		3	.606 [*]	.139	.000	.254	.958
	3	1	.256	.136	.208	-.089	.600
		2	-.606 [*]	.139	.000	-.958	-.254
Control	1	2	.250	.113	.128	-.054	.554
		3	.000	.125	1.000	-.338	.338
	2	1	-.250	.113	.128	-.554	.054
		3	-.250	.142	.295	-.632	.132
	3	1	.000	.125	1.000	-.338	.338
		2	.250	.142	.295	-.132	.632

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

Group		Value	F	Hypothesis df	Error df	Sig.
Experimental	Pillai's trace	.512	14.670 ^a	2.000	28.000	.000
	Wilks' lambda	.488	14.670 ^a	2.000	28.000	.000
	Hotelling's trace	1.048	14.670 ^a	2.000	28.000	.000
	Roy's largest root	1.048	14.670 ^a	2.000	28.000	.000
Control	Pillai's trace	.264	2.508 ^a	2.000	14.000	.117
	Wilks' lambda	.736	2.508 ^a	2.000	14.000	.117
	Hotelling's trace	.358	2.508 ^a	2.000	14.000	.117
	Roy's largest root	.358	2.508 ^a	2.000	14.000	.117

Each F tests the multivariate effect of Mindsets. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

T-tests

Paired Samples Statistics

Group			Mean	N	Std. Deviation	Std. Error Mean
Experimental	Pair 1	MindsetsAMean	3.7556	30	.74630	.13625
		MindsetsBMean	4.6167	30	.78802	.14387
	Pair 2	MindsetsAMean	3.7556	30	.74630	.13625
		MindsetsCMean	4.0111	30	.89371	.16317
	Pair 3	MindsetsBMean	4.6167	30	.78802	.14387
		MindsetsCMean	4.0111	30	.89371	.16317
Control	Pair 1	MindsetsAMean	3.6667	16	.86496	.21624
		MindsetsBMean	3.4167	16	1.03994	.25999
	Pair 2	MindsetsAMean	3.6667	16	.86496	.21624
		MindsetsCMean	3.6667	16	1.01471	.25368
	Pair 3	MindsetsBMean	3.4167	16	1.03994	.25999
		MindsetsCMean	3.6667	16	1.01471	.25368

Paired Samples Correlations

Group			N	Correlation	Sig.
Experimental	Pair 1	MindsetsAMean & MindsetsBMean	30	.332	.073
	Pair 2	MindsetsAMean & MindsetsCMean	30	.603	.000
	Pair 3	MindsetsBMean & MindsetsCMean	30	.599	.000
Control	Pair 1	MindsetsAMean & MindsetsBMean	16	.904	.000
	Pair 2	MindsetsAMean & MindsetsCMean	16	.869	.000
	Pair 3	MindsetsBMean & MindsetsCMean	16	.848	.000

Group			Paired Differences				
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
						Lower	Upper
Experimental	Pair 1	MindsetsAMean - MindsetsBMean	-.86111	.88742	.16202	-1.19248	-.52974
	Pair 2	MindsetsAMean - MindsetsCMean	-.25556	.74244	.13555	-.53279	.02168
	Pair 3	MindsetsBMean - MindsetsCMean	.60556	.75871	.13852	.32225	.88886
Control	Pair 1	MindsetsAMean - MindsetsBMean	.25000	.45134	.11283	.00950	.49050
	Pair 2	MindsetsAMean - MindsetsCMean	.00000	.50185	.12546	-.26742	.26742
	Pair 3	MindsetsBMean - MindsetsCMean	-.25000	.56765	.14191	-.55248	.05248

Paired Samples Test

Group			t	df	Sig. (2-tailed)
Experimental	Pair 1	MindsetsAMean - MindsetsBMean	-5.315	29	.000
	Pair 2	MindsetsAMean - MindsetsCMean	-1.885	29	.069
	Pair 3	MindsetsBMean - MindsetsCMean	4.372	29	.000
Control	Pair 1	MindsetsAMean - MindsetsBMean	2.216	15	.043
	Pair 2	MindsetsAMean - MindsetsCMean	.000	15	1.000
	Pair 3	MindsetsBMean - MindsetsCMean	-1.762	15	.098

Appendix 16: SPSS output for test anxiety two-way mixed ANOVA**Within-Subjects Factors**

Measure: MEASURE_1

TestAnxiety	Dependent Variable
1	TestATotal
2	TestBTTotal
3	TestCTotal

Between-Subjects Factors

	Value Label	N
Group 1	Experimental	30
2	Control	16

Descriptive Statistics

Group		Mean	Std. Deviation	N
TestATotal	Experimental	48.3667	12.96543	30
	Control	52.3125	11.85309	16
	Total	49.7391	12.60059	46
TestBTTotal	Experimental	46.9667	13.17386	30
	Control	49.8750	11.03253	16
	Total	47.9783	12.42487	46
TestCTotal	Experimental	45.6333	12.75359	30
	Control	48.0000	12.88410	16
	Total	46.4565	12.70644	46

**Box's Test of Equality
of Covariance
Matrices^a**

Box's M	1.418
F	.216
df1	6
df2	6104.329
Sig.	.972

Tests the null hypothesis
that the observed
covariance matrices of
the dependent variables
are equal across
groups.^a

a. Design: Intercept +
Group

Within Subjects Design:
TestAnxiety

Multivariate Tests^a

Effect		Value	F	Hypothesis df	Error df	Sig.
TestAnxiety	Pillai's Trace	.216	5.918 ^b	2.000	43.000	.005
	Wilks'	.784	5.918 ^b	2.000	43.000	.005
	Lambda	.275	5.918 ^b	2.000	43.000	.005
	Hotelling's Trace	.275	5.918 ^b	2.000	43.000	.005
	Roy's Largest Root	.275	5.918 ^b	2.000	43.000	.005
TestAnxiety * Group	Pillai's Trace	.016	.354 ^b	2.000	43.000	.704
	Wilks'	.984	.354 ^b	2.000	43.000	.704
	Lambda	.016	.354 ^b	2.000	43.000	.704
	Hotelling's Trace	.016	.354 ^b	2.000	43.000	.704
	Roy's Largest Root	.016	.354 ^b	2.000	43.000	.704

a. Design: Intercept + Group

Within Subjects Design: TestAnxiety

b. Exact statistic

Mauchly's Test of Sphericity^a

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
TestAnxiety	.731	13.476	2	.001	.788	.831	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Group

Within Subjects Design: TestAnxiety

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TestAnxiety	Sphericity Assumed	259.699	2	129.850	5.389	.006
	Greenhouse-Geisser	259.699	1.576	164.783	5.389	.011
	Huynh-Feldt	259.699	1.662	156.285	5.389	.010
	Lower-bound	259.699	1.000	259.699	5.389	.025
TestAnxiety * Group	Sphericity Assumed	13.439	2	6.719	.279	.757
	Greenhouse-Geisser	13.439	1.576	8.527	.279	.704
	Huynh-Feldt	13.439	1.662	8.087	.279	.716
	Lower-bound	13.439	1.000	13.439	.279	.600
Error(TestAnxiety)	Sphericity Assumed	2120.286	88	24.094		
	Greenhouse-Geisser	2120.286	69.344	30.576		
	Huynh-Feldt	2120.286	73.115	28.999		
	Lower-bound	2120.286	44.000	48.188		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	TestAnxiety	Type III Sum of Squares	df	Mean Square	F	Sig.
TestAnxiety	Linear	259.011	1	259.011	8.755	.005
	Quadratic	.688	1	.688	.037	.848
TestAnxiety * Group	Linear	13.011	1	13.011	.440	.511
	Quadratic	.428	1	.428	.023	.880
Error(TestAnxiety)	Linear	1301.652	44	29.583		
	Quadratic	818.634	44	18.605		

Levene's Test of Equality of Error Variances^a

	F	df1	df2	Sig.
TestATotal	.151	1	44	.700
TestBTTotal	1.156	1	44	.288
TestCTotal	.336	1	44	.565

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.^a

a. Design: Intercept + Group

Within Subjects Design: TestAnxiety

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	294854.778	1	294854.778	685.426	.000
Group	295.735	1	295.735	.687	.412
Error	18927.801	44	430.177		

Estimated Marginal Means

1. Group

Estimates

Measure: MEASURE_1

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	46.989	2.186	42.583	51.395
Control	50.063	2.994	44.029	56.096

Pairwise Comparisons

Measure: MEASURE_1

(I) Group (J) Group		Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
Experimental	Control	-3.074	3.707	.412	-10.545	4.397
Control	Experimental	3.074	3.707	.412	-4.397	10.545

Based on estimated marginal means

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	98.578	1	98.578	.687	.412
Error	6309.267	44	143.392		

The F tests the effect of Group . This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. TestAnxiety

Estimates

Measure: MEASURE_1

TestAnxiety	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	50.340	1.950	46.410	54.269
2	48.421	1.933	44.526	52.316
3	46.817	1.981	42.824	50.809

Pairwise Comparisons

Measure: MEASURE_1

(I) TestAnxiety	(J) TestAnxiety	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	1.919*	.746	.014	.414	3.423
	3	3.523*	1.191	.005	1.123	5.922
2	1	-1.919*	.746	.014	-3.423	-.414
	3	1.604	1.220	.195	-.855	4.063
3	1	-3.523*	1.191	.005	-5.922	-1.123
	2	-1.604	1.220	.195	-4.063	.855

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.216	5.918 ^a	2.000	43.000	.005
Wilks' lambda	.784	5.918 ^a	2.000	43.000	.005
Hotelling's trace	.275	5.918 ^a	2.000	43.000	.005
Roy's largest root	.275	5.918 ^a	2.000	43.000	.005

Each F tests the multivariate effect of TestAnxiety. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

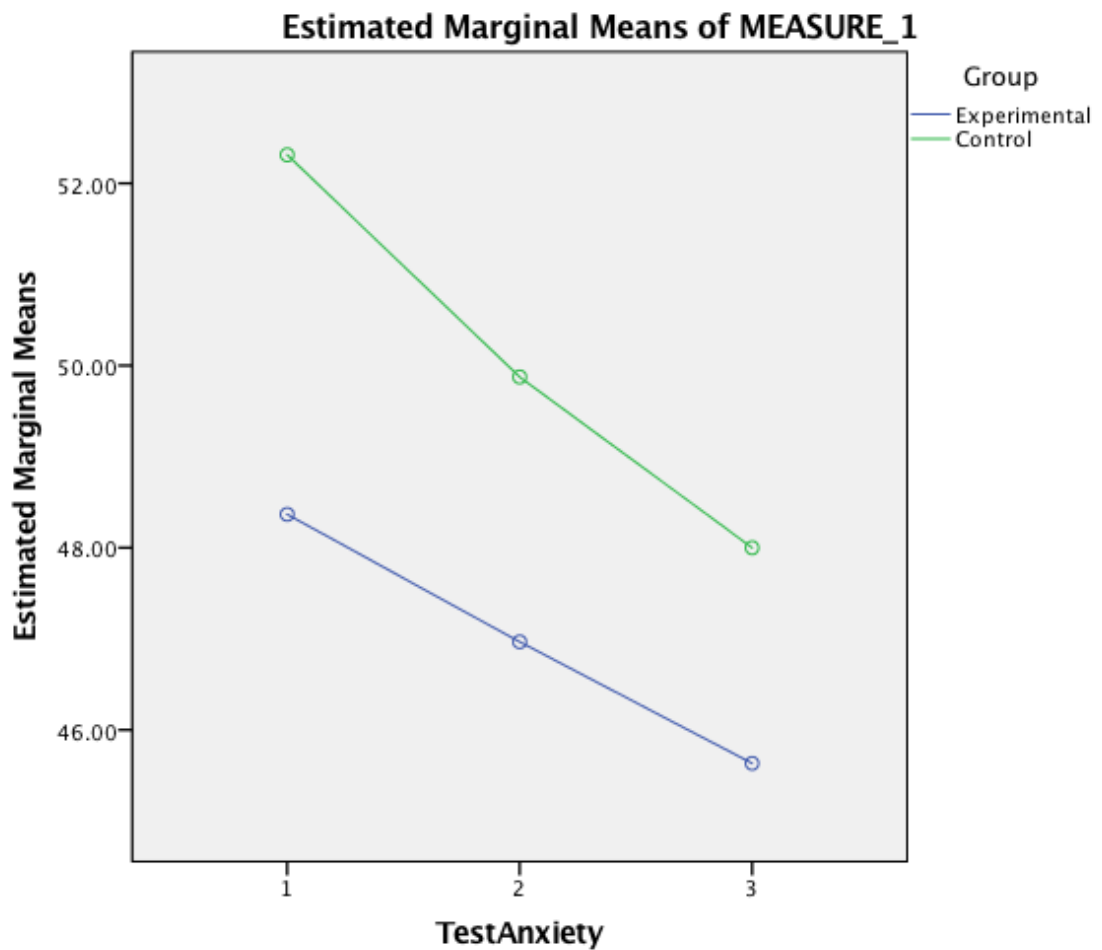
a. Exact statistic

3. Group * TestAnxiety

Measure: MEASURE_1

Group	TestAnxiety	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	1	48.367	2.300	43.731	53.002
	2	46.967	2.279	42.373	51.561
	3	45.633	2.337	40.924	50.342
Control	1	52.313	3.149	45.965	58.660
	2	49.875	3.121	43.584	56.166
	3	48.000	3.200	41.552	54.448

Profile Plots



Appendix 17: SPSS output for test anxiety post-hoc tests

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TestATotal	49.7391	46	12.60059	1.85786
	TestBTotal	47.9783	46	12.42487	1.83195
Pair 2	TestATotal	49.7391	46	12.60059	1.85786
	TestCTotal	46.4565	46	12.70644	1.87346
Pair 3	TestBTotal	47.9783	46	12.42487	1.83195
	TestCTotal	46.4565	46	12.70644	1.87346

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	TestATotal & TestBTotal	46	.927	.000
Pair 2	TestATotal & TestCTotal	46	.818	.000
Pair 3	TestBTotal & TestCTotal	46	.808	.000

		Paired Differences					t
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		
					Lower	Upper	
Pair 1	TestATotal - TestBTotal	1.76087	4.79437	.70689	.33712	3.18462	2.491
Pair 2	TestATotal - TestCTotal	3.28261	7.64392	1.12703	1.01265	5.55257	2.913
Pair 3	TestBTotal - TestCTotal	1.52174	7.79954	1.14998	-.79444	3.83792	1.323

Paired Samples Test

		df	Sig. (2-tailed)
Pair 1	TestATotal - TestBTotal	45	.016
Pair 2	TestATotal - TestCTotal	45	.006
Pair 3	TestBTotal - TestCTotal	45	.192

Appendix 18: Sample data from vignettes

	<p>→ I am (fixed)</p> <p>→ I need/could/should (growth)</p> <p>→ Excuse/explanation</p> <p>→ Other</p>			<p>- Growth → lots of comments linking effort and trying to progress and attainment</p> <p>- Fixed → poor performance is an inherent reflection on their sense of self</p>
	<u>Vignettes – Experimental</u>			
	Time 1	Time 2	Time 3	
What would this make you think?	<p>Pp 81. (3) – That the one subject that I liked, I wasn't very good at but because I liked the subject I'd want to re-do the test to try again for a better grade.</p> <p>Pp 30. (3) – That I am having a really bad day and just want it to end. May think there is no point in trying with school.</p> <p>Pp 29. (2) – That I am not very good at the subject.</p> <p>Pp 25. (2) – Didn't try hard enough. That hard work sometimes doesn't pay off. → Other</p> <p>Pp. 24 (1) – That I need to work harder in order to get better grades.</p> <p>Pp. 23 (2) – Weren't good enough. Didn't put enough work in. Defeated.</p> <p>Pp. 22 (1) – Annoyed that I didn't do more studying for the test. Think I've failed it.</p>	<p>Pp 6. (1) – I would think that I didn't try hard enough and I need to work harder next time.</p> <p>Pp 19. (1) – Get back up, practice and work harder.</p> <p>Pp 7. (1) – I need to put in more work to get a better score. Maybe I am not so good at this subject as I thought so I need to work hard.</p> <p>Pp 81. (1) – Make me think that I wasn't as good as I thought in a lesson.</p> <p>Pp 22. (2) – That I didn't know the topic very well. → Other</p> <p>Pp 9. (1) – I didn't work hard enough and deserve the grade I got. Growth</p> <p>Pp 10. (3) – I didn't work hard enough to get the grade I usually get. Growth</p> <p>Pp 30. (1) – That I probably didn't know it as well as I thought I had and</p>	<p>Pp 63 (1) – Need to work harder.</p> <p>Pp 79 (1) – I need to try harder.</p> <p>Pp 58 (3) – I would want to try harder on the next test.</p> <p>Pp 78 (1) – I should revise more.</p> <p>Pp 69 (2) – That I hadn't done a good job. I'd put loads of effort in for nothing.</p> <p>Pp 71 (2) – That I'm not good at presentations. That I was worse than the others.</p> <p>Pp 59 (3) – That I need to try harder in the next test.</p> <p>Pp 80 (2) – That I'm going to fail.</p> <p>Pp 37 (3) – I would be a bit irked at my friend.</p> <p>Pp 42 (1) – I don't know as much as I did.</p>	

Aside from the growth and fixed mindset comments, ~~other~~ participants commented on the negative emotions they might experience (e.g. 'disappointed', 'upset', 'embarrassed'), excuses/explanations for why they hadn't done as well as they could have liked, as well as mentions of sources of support.

	<p>Pp 19. (3) – Frustrated with myself but wouldn't give up on everything, tomorrow's another day and if I'm passionate about the subject itself I would look back on the paper and find the mistake.</p> <p>Pp 11. (3) – I'm just having a bad day.</p> <p>Pp 10. (2) – That it was a waste of time doing it. That I need to ask for help/support.</p> <p>Pp 9. (3) – They're going through the exact same stress as me, so I can't get upset about them dismissing me.</p> <p>Pp 7. (3) – What's the point anymore. I give up. What does the future hold for me, or do I even have one.</p> <p>Pp 6. (3) – I would think that my friend really cared about me and doesn't like me as much as she said she does. I would also think that I'm not good enough.</p> <p>Pp. 39 (1) – I'd want to find out what I did wrong.</p>	<p>should have revised.</p> <p>Pp 14. (3) – One off, normally do well.</p> <p>Pp 29. (3) – That I need to work harder next time but it is only a mock so would work harder for the real exam.</p> <p>Pp 11. (1) – That I need to do more work.</p> <p>Pp 23. (3) – Disappointed – need to work harder. Just a bad day.</p> <p>Pp 25. (3) – Feel useless, let down, defeated and disappointed.</p> <p>Pp 24 (2) – Demotivated, less confident.</p> <p>Pp 31. (3) – That I'm not as good as other pupils.</p> <p>Pp 32. (3) – Everyone's rude.</p> <p>Pp 33 (1) – That I should have studied harder and that I didn't know as much as I thought.</p>	<p>Pp 39 (1) – Confused as to why I did so poorly.</p> <p>Pp 40 (2) – The presentation may not have been as good as the others. The chosen topic may interest some but not many, therefore it could've been good and they not have enjoyed it.</p> <p>Pp 43 (1) – That I need to do more revision before tests and I am not as clever as I thought I was.</p> <p>Pp 31 (1) – Not as good as everyone else in the class.</p> <p>Pp 41 (1) – I need to work harder and target my weaknesses.</p> <p>Pp 32 (1) – Why did I get a low score?</p> <p>Pp 38 (3) – Didn't revise/try hard enough. Friend doesn't care.</p> <p>Pp 36 (2) – Could of done a topic more suitable. I enjoyed the topic so doesn't matter.</p> <p>Pp 7 (2) – What's the point, why do I</p>
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Other

Some comments had contradictions + so hard to categorise → elements of growth + fixed

Other

Other

Vignettes – Control

	Time 1	Time 2	Time 3
What would this make you think?	<p>Pp 12. (3) – I would think that there might be something wrong with my friend, because it is unlikely that she would brush me off for no reason. I might worry that she's upset with me. I would think of that day as a bad day and think of what I could do to prevent it from happening there.</p> <p>Pp 28. (1) – I did not do enough work.</p> <p>Pp 27. (2) – That I failed and that I was the worst one in class.</p> <p>Pp 1. (1) – I'd think that I was being over confident and next time I would try to better my score.</p> <p>Pp 26. (1) – That even if I try for anything again in life, or try to do my best, it would not be good enough.</p> <p>Pp 21. (2) – That nobody liked me because I didn't do well, or that they were judging me. I failed.</p> <p>Pp 20. (2) – That I've made mistakes</p>	<p>Pp 77 (2) – That my favourite topic wasn't interesting and so I feel disheartened.</p> <p>Pp 72 (2) – Like it wasn't worth the effort. Not understanding what went wrong.</p> <p>Pp 70 (2) – Think that everybody disliked me for not presenting an interesting topic.</p> <p>Pp 67 (1) – That I need to do more focused studying and revision sessions.</p> <p>Pp 64 (1) – I did not revise enough or I was overconfident with my own abilities.</p> <p>Pp 76 (1) – That I'm not as clever as I thought.</p> <p>Pp 75 (3) – Why can't they help me?</p> <p>Pp 85 (1) – It would be very hard to improve. Would my tests improve in</p>	<p>Pp 73 (3) – I would feel quite down and frustrated with myself. I may think that my friend did not have the time to listen to my problems.</p> <p>Pp 77 (3) – My day can't get any worse. I've failed.</p> <p>Pp 67 (2) – That I wasn't good enough for this specific class.</p> <p>Pp 60 (1) – That I'm not good enough. Stupid.</p> <p>Pp 70 (3) – It would make me think that it didn't revise hard enough to get a better grade.</p> <p>Pp 64 (2) – That I didn't work hard enough and had to do better.</p> <p>Pp 20 (1) – That all my work went to waste.</p> <p>Pp 5 (3) – Just my luck. I can't get even basic things right that I've done before. I've actually got so much</p>

	<p>or misunderstood the task.</p> <p>Pp 16. (2) – Not as good as other students.</p> <p>Pp 15. (1) – Like I should of worked harder. That I have a lower intelligence than everybody else, so maybe I would need to switch classes.</p> <p>Pp 8. (3) – I can't do exams. I can't do the subject.</p> <p>Pp 5. (1) – Everyone else is really clever and it's not fair. Other people probably didn't revise that much but still did better than me. I thought I understood it, why do I always fail.</p> <p>Pp 4. (1) – It would make me think that I'd failed and I wasn't naturally good at the subject.</p> <p>Pp 3. (1) – I should have revised more because I need the best score to prove my intelligence and to get where I want in life. I would revise the questions I didn't know more and read around the subject so I'm more</p>	<p>the future? I'm failing. Mum won't be happy.</p> <p>Pp 73 (2) – That I had wasted a lot of time and effort for nothing.</p> <p>Pp 66 (3) – Because it would make me feel that I couldn't achieve highly.</p> <p>Pp 57 (2) – Should have worked harder.</p> <p>Pp 60 (3) – Your friend doesn't care. You're not good at that subject.</p> <p>Pp 86 (3) – I need to try harder.</p> <p>Pp 3 (2) – I should have prepared earlier. Chose a different topic for the presentation. I didn't do well. Annoyed that I put effort in and it didn't go well.</p> <p>Pp 4 (2) – I'd be very disappointed and feel like a failure if I'd worked really hard on it. → Fixed</p> <p>Pp 26 (2) – Would think about all the reasons why my classmates didn't seem to like it.</p>	<p>worse at this subject.</p> <p>Pp 26 (3) – There is just no point in bothering with revision/revising again if I tried for a test and it only came back with a grade D.</p> <p>Pp 8 (3) – I'm stupid. I can't do exams or my subjects. I'm having a really bad day.</p> <p>Pp 4 (3) – That I revised incorrectly or need to do more revision on certain topics.</p> <p>Pp 28 (3) – That I did something bad and unusual to get a D.</p> <p>Pp 21 (1) – I should have revised more. Maybe I'm not as good at this as I thought.</p> <p>Pp 15 (3) – That I should of worked harder. That I was the worst in the class.</p> <p>Pp 16 (1) – Should have revised more.</p>
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Although a little bit of both.

→ Bit of both

" "

Appendix 19: Sample data from the session evaluation sheets

99	• Explain the usefulness of a mindset.	Real-life application
100		
101	How will you use the information from the session in the future?	
102		
103	• Apply to exam stress.	Exam stress
104	• Will use it for myself so that I challenge myself to work harder.	Increase challenge
105	• Reminder not to give up.	Motivating
106	• Not give up when something goes wrong.	"Not give up."
107	• Not give up on hard tasks.	"I will not give up."
108	• Attempt to have more growth mindset.	Shift in perceptions
109	• Mindset in school, workplace, exam time.	Exams
110	• To help me revise for future exams.	Exams
111	• Do lots of practice.	
112	• Apply my understanding and rehearse the information I learn.	
113	• To know that I can grow in knowledge and I am not just stuck at one intelligence level.	Personal growth.
114		
115	• Practice makes perfect!	
116	• I will use it to help develop my mindset and help myself in future tests and exams.	
117	• To motivate myself to learn more.	Motivating
118	• Work hard and know that it pays off.	Impact of challenge/effort
119	• Not say "I can't do it" to something so easily.	Acceptance of challenge.
120	• I won't really. It was more like a lesson but psychology is not something I'm really	
121	interested in.	
122	• It probably won't, psychology is my least favourite thing as I failed it at GCSE.	
123	• I won't give up.	Not giving up.
124	• Maybe.	
125	• If I work hard, I can get good grades and get the grades I want.	Impact of Effort
126	• If I work hard I can get good grades.	Effort
127	• Work harder. Stay motivated. Don't give up.	Not giving up/motivating/effort
128	• In psychology – all about the brain.	
129	• Yes.	
130	• To remind myself not to give up.	

- 131 • When finding things hard with exams to remember that I can improve my intelligence. *Opportunities to improve*
- 132
- 133 • I will apply this information when studying for my exams. *Exams*
- 134 • To never give up if things aren't going well and to remember you can get better if you want to. *Never give up.*
- 135
- 136 • To help me want to learn more to ensure I improve in the long run for my future. *Encouraging learning*
- 137 • To have an improved approach with any future challenges. *Change in perceptions*
- 138 • Have a good mindset.
- 139 • As a reminder to keep working hard. *Work hard.*
- 140 • Take a different view on mindsets whilst doing tasks.
- 141 • Continue to understand that I can improve and develop myself if I put my mind to it. *Improve and develop*
- 142
- 143 • Take a different view into mindsets.
- 144 • Keep in mind. It will improve anxiety. *Improve mental wellbeing*
- 145
- 146 **Any general comments?**
- 147
- 148 • Thank you ☺.
- 149 • Very motivational/useful. Thank you ☺. *Motivational*
- 150 • A good lesson and an interesting topic. *Interesting*
- 151 • Very interesting.
- 152 • Thank you for sparing your time.
- 153 • I enjoyed this and found it really interesting.
- 154 • No.
- 155 • Make it less like a lesson.
- 156 • Make it less like a lesson.
- 157 • It was interesting ☺.
- 158 • I enjoyed it ☺.
- 159 • A fun exercise to do.
- 160 • A good lesson. Learnt new things. Very helpful.
- 161 • "This would be very useful for some to know from a much younger age as they are stuck in a fixed negative mindset throughout their school life."¹⁷
- 162

Appendix 20: Table of database search terms and returns

Literature searches were conducted between December 2015 and December 2016.*

The search terms 'exam anxiety' and 'academic anxiety' were considered as alternative terms for 'test anxiety'. 'Test anxiety' was searched both as a subject heading and as a keyword in the PsycINFO database.

In addition to the more traditional databases, general searches were conducted using Google Scholar as well as library searches for books through the Cardiff University library service. General media searches using Google were also completed.

Due to the size of the literature base, not all research was included and was selected based on its relevance to the current study.

Database	Search terms	Number of results
PsycINFO 1806 to 2016	Test anxiety (subject heading), test anxiety (keyword) exam anxiety OR academic anxiety	3891
	Test anxiety (subject heading) AND test anxiety (keyword)	3824
	Test anxiety (subject heading) OR exam anxiety OR academic anxiety	2813
	Test anxiety (subject heading)	2734
	Test anxiety (subject heading) AND education (subject heading)	188
	Test anxiety (subject heading) AND school	42
	Test anxiety (subject heading) AND education (subject heading) AND intervention	4
	Intelligence (subject heading) AND intelligence (key word)	117765
	Dweck	293
	Self-theories	161
	Self-theories AND intelligence (subject heading) AND intelligence (key word)	39
	Self-theories AND education (subject heading)	26
	Self-theories AND school	24
	Self-theories AND Dweck	24
	Self-theories AND intervention	13
British Education Index (BEI)	Test anxiety OR exam anxiety OR exam stress OR academic anxiety	185
	Test anxiety	160
	Test anxiety OR exam anxiety	159

	OR exam stress OR academic anxiety AND education	
	Test anxiety OR exam anxiety OR exam stress OR academic anxiety AND school	89
	Test anxiety OR exam anxiety OR exam stress OR academic anxiety AND intervention	12
	Test anxiety OR exam anxiety OR exam stress OR academic anxiety AND school OR education AND intervention	7
	Intelligence	1710
	Self-theories	52
	Self-theories AND education	51
	Self-theories AND school	29
	Dweck	14
	Self-theories AND intervention	5
	Self-theories AND intelligence	4
	Self-theories AND Dweck	2

*Search returns have been recorded from searches completed in December 2016.