An investigation into the relationship between climate change anxiety and attitudes towards climate actions

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Declaration

The research reported in this thesis is my own original work and has not been submitted for any other award. The author has checked the thesis for completeness prior to submission.

Acknowledgements

Thank you to my supervisor, Dr Alice Welham, for supporting me with the greatest amount of kindness and patience. These are beautiful qualities of yours which, in addition to your infallible understanding of research and statistics, make you a wonderful supervisor.

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Albie, my sweet and lovely toddler, you have helped me to finish this thesis in more ways than I can count. Your determination and curiosity inspire me. Your love of the world and exclamations of “wow!” at the simplest of things have kept me grounded, which was needed many times throughout the write-up of this project.

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Thesis Abstract

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The two chapters of this thesis are separate; therefore, shortened abstracts are presented here as an overview of each chapter. Expanded abstracts are presented in the main body of the thesis for each chapter.

Literature review

Effective interpersonal coordination between people is an essential part of social interaction. This review explored the literature that investigated the interaction between self-reported emotional experiences and Joint Action tasks, that is, tasks that require collaboration between individuals. Eleven papers were reviewed. Empathy was the most observed interpersonal, and emotional experience in the reviewed papers. Affect, anxiety, and romantic emotions were also observed. The systematic review found that participants with higher empathic traits were more likely to co-represent another person's actions during a task, leading to task interference.

Empirical report

Climate change and its impact on our lives are causing worry and anxiety globally. To investigate climate anxiety in a local UK population, over 1000 participants completed a questionnaire that explored three research questions 1) how anxious were the local population about climate change? 2) what expectations does this population have of themselves and others with regard to climate actions, and

3) what attitudes does the population hold around the rewilding of private and public spaces as a climate action? This population reported lower levels of climate anxiety than other populations. Interactions between the age and gender of participants influenced reports of climate anxiety and attitudes towards engagement in climate actions such as rewilding.

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**denotes mandatory appendix*

Chapter 1: Literature Review

A systematic review of the influence of self-reported emotional experiences on joint actions

Abstract

Background: Interpersonal coordination is an essential part of the human experience. Joint action (JA) research in cognitive and neuropsychology has attempted to explore the mechanisms underlying JA. Despite a vast scientific evidence base there remain gaps in the literature around how affective processes influence JA. This review examines the relationship between self-reported emotional experiences and JA tasks.

Method: Systematic searching of databases resulted in just eleven empirical papers that required participants to complete self-report measures of emotional experience. Measures such as the Affect Grid, which recorded the participant's levels of arousal and valence, and various empathic trait questionnaires were used. To be included in the review the papers had to observe collaborative performance on a JA task between adult participants.

Results: Three categories of JA task were used; stimulus-response compatibility tasks, body synchronization and spatial location, and music-playing tasks. All papers that reviewed empathic traits in participants found an association between empathy and JA task performance. Levels of arousal also influenced JA performance as did romantic emotions towards one's co-actor. However, self-reported levels of social anxiety did not influence a JA task.

Conclusion: Self-reported emotional experiences appear to influence interpersonal coordination. Participants with self-reported high empathic traits appear to experience greater interference in JA tasks compared to participants with low empathic traits, perhaps due to stronger co-representation of a co-actor's actions.

1. Introduction

Human interactions are an essential and frequent part of everyday life (Dolk et al., 2014a). Many everyday social interactions involve two or more individuals working together to achieve a shared goal (e.g., when a customer interacts with a cashier to purchase groceries, or a group of individuals who play football as a team to win a game). The term Joint Action (JA) is often used in cognitive neuroscience and psychology research to describe the act of two or more persons coordinating their actions to achieve joint goals, which is essential for our success as social beings (Sebanz et al., 2006).

1.1 The empirical study of joint action

Researchers have investigated the cognitive, perceptual, and motor mechanisms that underly coordination between individuals (Bieńkiewicz et al., 2021; Dolk et al., 2014b; Vesper et al., 2017). This empirical study has yet to fully determine the cognitive processes involved in JA (Sacheli et al., 2022). Such research has suggested the phenomenon of co-representations, the cognitive representation in a person's mind of another person's goals and actions is a key mechanism in JA (Milward & Carpenter, 2018). The ability to form shared representations may be an essential element of social cognition (Novembre et al., 2012).

Co-representation is often explored using stimulus-response compatibility (SRC). For example, when instructed to complete a SRC task with another person, participants appeared to represent the intentions or actions of their co-actor, which interfered with the outcome (Sebanz et al., 2003; van der Weiden et al., 2019). The reaction times in response to target stimuli in SRC tasks seem to be slower during a jointly performed task than when the task is completed alone, due to interference caused by the attention given to and mental representations of a co-actor's aims and actions during the task (Sebanz et al., 2003). In other words, a person will involuntarily co-represent the intentions/actions of a co-actor, even if it makes them perform worse individually.

To study the functional implications of co-representation on actions between individuals, the Joint Simon task is commonly applied. This is a SRC that requires participants to respond quickly to target (go) stimuli and to inhibit responses to 'no-go stimuli' and in a joint action condition, a co-actor would respond to stimuli in a converse way (Sebanz et al., 2003). Response times are usually faster when both the stimulus and response locations overlap (e.g., when the target stimulus appears on the left side of the screen and the participant's seat and button are also to the left of the screen). This is called a compatible trial. Reaction times are typically slower on incompatible trials (when stimulus and response locations differ). This is illustrated in Figure 1. This pattern is a spatial compatibility effect and is known as the Simon Effect (Dolk et al., 2014). The Joint Simon Effect (JSE) occurs when pairs of participants each respond to just one of two target stimuli but reaction times are still slower on incompatible trials than on compatible trials. One hypothesis proposes that individuals automatically co-represent and therefore integrate their co-actor's actions, goals, and responses into their own mental action-system that determines their responses to the task (Schmitz et al., 2017).

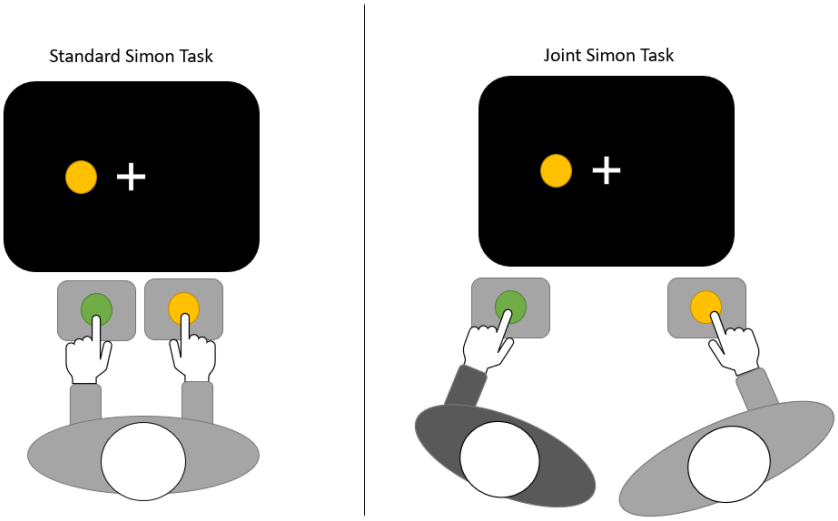

Figure 1. Illustration of a Standard Simon Task and a Joint Simon Task experimental arrangement. The Standard Simon Task illustrates an example of an incompatible trial as the spatial location of the yellow target stimuli is on the left side of the screen, but the yellow response button is on the right side of the participant.

Other theoretical approaches to understanding JA include the dynamical-systems approach. Dynamical-systems approach studies on joint action typically involve monitoring behaviour over time, with a focus on movement coordination, rather than during a discrete task that involves focused responses to specific stimuli (van der Wel et al., 2021). Dynamical systems JA studies suggest entrainment is a core mechanism underlying coordination between individuals, that is, the tendency for spatiotemporal coordination to occur spontaneously between individuals moving in a similar way, such as when rocking chairs near each other (Richardson et al., 2007) or when audiences clap together (Néda et al., 2000).

1.2 Emotional experiences and joint action

The theoretical work summarized here sits within the empirical research into the cognitive, perceptual, behaviour, and motor processes involved in coordinating joint actions between people. Such coordination often takes place without conscious awareness or verbal communication between co-actors (Salmela & Ngatsu, 2017). However, this empirical exploration of JA forms just one of two roots of the 'phenomenology of joint action', as proposed by Salmela & Ngatsu (2017). The authors refer to this first root as a 'minimalist' approach. The second root, the 'maximalist' approach, is the more philosophical study of shared intentions in the coordination of JA. Salmela & Ngatsu (2017) propose the second root, which involves consideration of interpersonal affective processes, has been neglected in the JA research.

Furthermore, A joint action researcher, Anika Fiebich, argues that social cooperation is a three-dimensional phenomenon and suggests that it can be placed along three axes: 1) a cognitive, 2) a behavioural, and 3) an affective axis (Fiebich, 2019). Indeed, the affective axis, appears to have attracted less interest compared to the cognitive and behavioural axis (Sebanz & Knoblich, 2021). The literature that has explored emotional experience and JA has found that interpersonal emotional experiences may be a motivating and justifying reason for JA (Salmela & Nagatsu, 2016). It is evident in everyday social interactions that an understanding of the emotional experience of another person and the ability to reflect on one's own emotions can influence the initiation and coordination of social interactions. For example, when identifying a friend needs to be comforted or when a parent uses co-regulation to help a young child to self-regulate difficult emotions (Silkenbeumer et al., 2016). Understanding the emotional experience of another person is also an essential

part of psychological therapy and forming an interpersonal alliance between therapist and client is an integral element of the therapeutic relationship in psychological therapy (Nienhuis et al., 2016). A meta-analysis of research into therapeutic alliance identified perceptions of the therapist's empathy towards the client and genuineness to be significantly related to the strength of the therapeutic alliance. The analysis lends Rogers' (1957) definition of the construct of therapist genuineness, which defines it as "therapists being an accurate representation of their self, and therapists communicating their in-therapy experience of the client back to the client". To contemplate the relationship between affective, and interpersonal processes such as emotional experiences on the outcome of the joint task of therapy, particularly in Cognitive Behavioural Therapy where there are clearly outlined therapeutic goals, is to move away from the minimalist approach to JA research and towards the maximalist approach. However, an understanding of the relationships between affective processes and the minimalist, low-level architecture JA initiation and coordination could offer insight into the social nature of human minds (Sebanz & Knoblich, 2021).

Core elements of social cognition involve perspective-taking and theory of mind, that is the ability to mentally represent another person's perspective of the present space and to make associations between the behaviour of others and the mental states that generated them (Sacheli et al., 2022). A growing field of minimalist JA research that has considered affective processes has explored the impact of emotional experiences on the formation of representation of another's actions. For example, higher self-reported empathic traits appeared significantly correlated to increased interference in a joint SRC task (Ford & Aberdein, 2015). Interestingly, this relationship was found specifically for the 'perspective-taking' element of empathy, defined as "the tendency to adopt the point of view of others" (Davis, 1983). And only when the SRC task was completed with a friend, not a stranger. It seemed friendship pairs consisting of empathic individuals who were likely to adopt the perspective of other people were more likely to co-represent the task goals of their friend, which slowed down and interfered with their own response to their target stimuli. Similarly, Muller and colleagues (2011) identified the paucity of research into the social factors that may influence shared representations and set out to investigate this. The authors specifically asked participants to complete a Joint Simon Task with a co-actor deemed to be an "in-group" member (like themselves with regards to skin colour) or an "out-group" member (of dissimilar skin colour). The experiment found the actions of the in-group co-actor were more likely to be co-represented than those of the out-group co-actor (Muller et al., 2011). Furthermore, when participants were asked to actively consider the perspective of the out-group member prior to completing the task, the actions of the out-group co-actor were then co-represented. Both studies suggest that the interpersonal process of empathy, specifically perspective-taking, may increase the co-representation of another's actions during a joint task and influence JA outcomes.

Empathy, the ability to perceive the emotional needs of others, understand their emotional states and respond to them, is a process interconnected with other shared emotional experiences, which are fundamental dimensions of our sociality (Szanto & Kreuger, 2019). This includes acting jointly with another person/s (Fiebich, 2019). Shared emotional experiences between people can be motivating factors in the initiation of collective actions between people. They may also facilitate the maintenance of such actions or tasks. Indeed, shared or collective emotions may be a motivating reason for people to come together intentionally to carry out a joint action (Salmela & Ngatsu, 2016).

1.3 The aims of this review

A recent review of the interaction between emotions and JA was published which discussed the relationship from a neuroscience approach (Bieńkiewicz et al., 2021). This review found the study of the relationship

between emotional experiences and the cognitive or neural underpinnings of JA have largely been studied in parallel. However, Bienkiewicz and colleagues' review focuses on the neuropsychological research. The current progress into self-reported affective processes, emotional experiences and JA has yet to be reviewed. Such a review may identify elements of the emotional or social experience to focus future JA research on. Additionally, exploring an individual's own account of their emotional experiences, rather than observed biomarkers, may provide an overview of research that bridges the two roots (minimalist and maximalist) of the phenomenology of joint action outlined by Salmela and Ngatsu (2017).

Therefore, this review aimed to examine research that required participants to provide an account of their emotional experience. This experimental design differs to much of the JA and emotions research which takes a neuropsychological approach. This literature review asked, *"what influence does self-reported emotional experience have on the coordination of joint actions between two people?".*

2. Method

This project aimed to collect and review all empirical research that explored joint action performance between two adults, with an observation or measurement of the emotional experience between participants. Bramer and colleagues' (2018) systematic approach to developing literature searches was followed to develop the search strategy (Bramer et al., 2018).

2.1 Search terms

First, the research question was analysed to determine effective and appropriate search terms. Prior knowledge gained via the extensive scoping of the literature in the field of joint action helped in the construction of the search terms. The search strategy contained the two main elements of the research question; 1) Emotional experience and, 2) Joint action.

An initial scope of the relevant literature revealed key themes and associated processes that guided the development of search terms. 'Interpersonal processes' and 'empathy' were identified as social processes strongly associated with the phenomenon of 'emotional experiences'. 'Coordination' was used as a search term relating to 'joint action' as it may have revealed literature that categorised tasks between two participants as "coordination" rather than a "joint action". Furthermore, as per the search strategy outlined by Bramer and colleagues (2018) the thesaurus of the first database searched was used to identify index terms for each key element. To optimize the search strategy the abstracts of key papers were scanned, and additional, relevant synonyms were added to the search strategy. The finalised search terms are presented in Table 1.

TABLE 1: DATABASE SEARCH STRATEGY

Search terms:		
("joint action*" or "joint task*")	AND	(Emotion* or affect* or mood or feeling* or empath*)
Limits applied:		
English language only	AND	Published in an academic journal

2.1.1 Databases

The PsychInfo, Web of Science Core Collection, and SCOPUS databases were used to search the literature in September 2021. The search was run again in June 2022, and this found no further relevant articles. Key papers and authors, identified during an initial scope of the literature, were also specifically sought in the results to ensure the search engines and terms used yielded appropriate literature. Specific syntaxes and rules were considered when using each database and limits were applied (English language and academic journals only) (see Table 1).

2.2 Selection criteria and exclusions

Inclusion and exclusion criteria were developed around the Participants, Intervention, Comparator, Outcome measures, and Study design (PICOS) framework (Amir-Behghadami & Janati, 2020). Titles and abstracts were screened using the screening and selection tool (Table 2), which was developed using the guide provided in *Doing a Systematic Review* (Boland et al., 2017). For some papers, it was immediately evident at the screening of the title and abstract stage that they did not meet the inclusion criteria and therefore the form was not fully completed for these papers.

TABLE 2: SCREENING AND SELECTION TOOL

Date of review:	**Author/s:**	
Publication year:	Title:	
	Include:	**Exclude:**
Patient population:	Adults aged over 18 years	Any persons under 18 years
Interventions:	An explicit manipulation or observation of emotions shared or experienced between two participants. Where the emotional state is manipulated, the success of this is checked via a self-report measure	A joint action task only, without any observation or manipulation of the emotional experience of participants
Comparators:	Observation of performance on or the initiation of a jointly performed task between two people	Large group behaviour observations such as demonstrations, team decision-making, or audience responses.
Outcomes:	Reports the outcome of the relationship, if any, between an emotional experience of the participants and joint action performance	Does not report any outcome that correlates the experience of shared emotions and the initiation of or performance of a joint action
Study design:	Experimental	Any other study design
Overall decision:	Included	Excluded
Notes:		

RefWorks software was used to import, store, and manage references. This was also used to screen the titles and abstracts of the papers. Once all titles and abstracts were screened, the full texts were acquired for the papers that met or might have met the inclusion criteria. The selection and screening tool was completed for the full texts to determine whether the paper was suitable and eligible for review. For five papers, both the researcher and their supervisor completed screening and a consensus was reached following a discussion about their eligibility. Figure 2 illustrates the search and screening process.

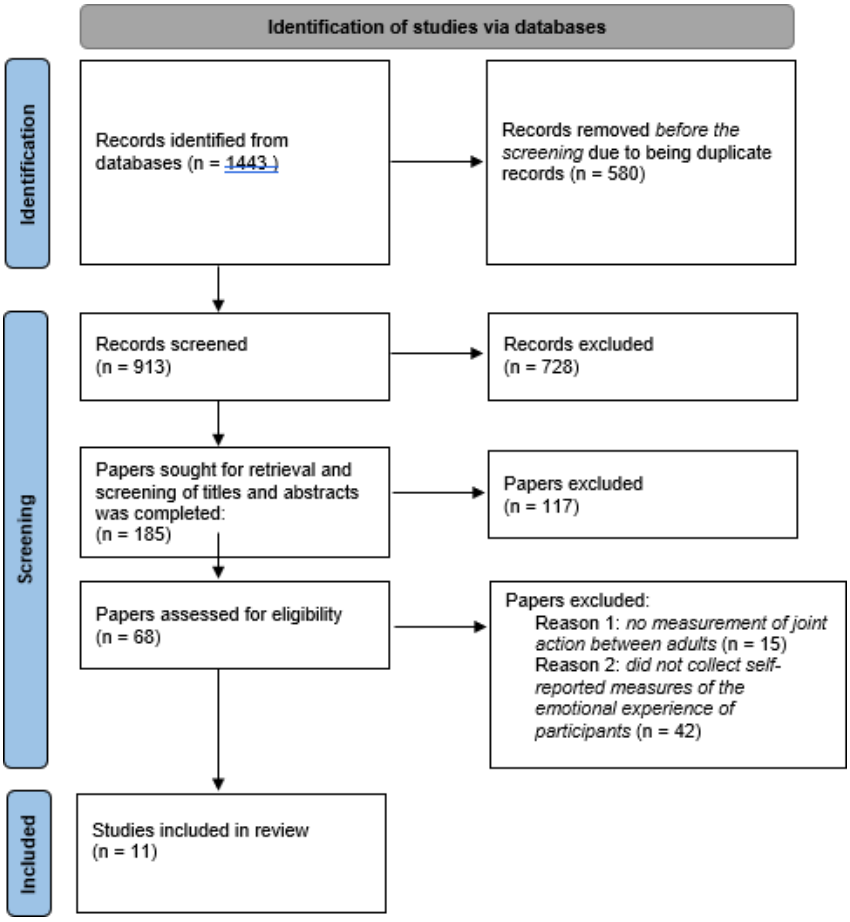

FIGURE 2: PRISMA FLOW DIAGRAM SUMMARISING SCREENING AND SELECTION PROCESS

2.4 Data extraction

To answer the present study's question and aims, the applicable data were extracted from all eleven studies that met the inclusion criteria (Table 2). A detailed data extraction form was used to evaluate the outcomes of each paper (see Appendix C). Details of the joint action task used, which varied across the studies, were collected, as well as details of how the emotional experience of concern was measured in each study.

2.5 Quality appraisal

The quality of each paper was assessed using a quality appraisal tool developed for the appraisal of quantitative studies (Evans et al., 2015) (see Appendix D). This tool provides eight areas or components to be appraised. Each component is rated 'strong', 'moderate', or 'weak' in quality, with a global rating assigned depending on how many components were qualified as 'weak'.

3. Results

3.1 Overview

The search strategy and selection criteria yielded 11 research papers to be reviewed.

3.2 Study characteristics

All included studies use quantitative methodologies but varied in their experimental design and choice of JA task. A summary of the characteristics of each study are presented in Table 3. The publication year range for the included papers was from 2010 to 2020. All the studies asked pairs of participants to complete a JA task together.

TABLE 3: SUMMARY OF THE CHARACTERISTICS OF REVIEWED PAPERS

#	Study	*N*	Participant group/s*	Age	Sex	Payment	Joint task	How was the outcome of the joint task measured?	Measure of emotional experience used
1	Ford and Aberdein, 2015	44	Undergraduate students.	*M* = 22.50, SD = 5.49,	Friendship pair: n = 22, female = 15.	Small payment or course credit	Joint Simon Task	RT & ER	EQ & IRI
			Paired into friendship pairs (*n*=22) and stranger pairs (*n*=22).	17-44 years	Stranger pair: n = 22, female = 15.				
2	Van der Wieden et al., 2016	130	Split into two groups depending on their scores on the IRI	*M* = 20.68, SD = 2.43	Female = 86, Male = 44	Not stated	Joint Simon Task	RT & ER	IRI
3	Quintard et al., 2020	56	Heterosexual romantic couples and friendship pairs.	*M* = 21.31, SD = 2.6	Female = 28	A financial payment, but no further details are provided.	Joint Simon Task	RT & ER	PLS
4	Liepelt and Raab, 2020	32	Students	*M* = 23.7, SD = 5.3	Female = 19	Course credits	Joint Simon Task	RT & ER	Affect Grid
5	Kuhbander et al., 2010	84	Undergraduate students	*M* = 25.4, SD = 6.3	Female = 67	Not stated	Go/No-go task	RT & ER	Affect Grid
6	Wenke et al., 2011	32	Not stated	Not stated	Not stated	Not stated	Go/No-go task	RT & ER	BEQ
7	Hartman et al., 2019	68	Undergraduate students who were acquainted with each other	*M* = 25.4, SD = 11.5	Female = 48	Not stated	Joint random number generation task	Random number generation and body position	IRI

8	Novembre et al., 2012	15	Pianists	*M* = 23.6, SD = 2.79	Female = 11	Not stated	Music-making task	Music-playing synchronization	IRI
9	Huberth et al., 2019	18	Pianists	*M* = 22.4, SD = 3.2 years	Female = 7	$20 per hour. Involvement lasted around 3.5 to 4 hours.	Music-making task	Music-playing synchronisation	EQ
10	Novembre et al., 2019	58	Non-musician participants. Split into high and low-empathy groups, based on their pre-experiment IRI scores	*M* = 25.64, SD = 8.54	Female = 39	Not stated	Music-making task	Music-playing synchronisation	IRI
11	Varlet et al., 2014	38	Split into two groups of 19. 1) Participants diagnosed with Social Anxiety Disorder, according to the DSM-IV. And 2) 19 healthy participants who were matched in terms of age, sex, and premorbid IQ. Pairs were then created with a participant from each of the groups.	*M* = 34.53, SD = 12.59 for the SAD group	12 male, 7 female, for the SAD group	Not stated	Movement task	Social motor coordination	LSAS

Notes: RT = reaction times, ER = error rates. EQ = Empathy Quotient (Baron-Cohen & Wheelwright, 2004), IRI = Interpersonal Reactivity Index, Affect Grid (Russel et el., 1989), BEQ = Bamberg Empathy Questionnaire, LSAS = Liebowitz Social Anxiety Scale (Fresco et al., 20001), PLS = Passionate Love Scale (Quintard et al., 2020).

**Assumed to be strangers unless otherwise stated.*

3.3. Heterogeneity

Shared characteristics, methodologies and contrasts between studies were explored. Included papers used varied quantitative methodologies, which were grouped into three categories for the review.

3.4 Study findings

3.4.1 Overview

The eleven research papers included in the review varied in terms of the number of participants (from 15 to 130 participants) but all articles asked participants to complete the JA task in dyads. Most studies recruited participants who were unacquainted with each other prior to taking part in the research but one paper observed friendship pairs (Ford & Aberdein, 2015), while Quintard and colleagues (2020) compared friendship pairs' performance on a JA task against that of romantic couples.

3.4.2 Joint action task

Six of the papers used computer-based tasks. Four of these papers used a stimulus-response-compatibility (SRC) task, the joint Simon Task (Ford & Aberdein, 2015; Liepelt & Raab, 2020; Quintard et al., 2020; van der Weiden et al., 2019). Two of the papers used a Go/No-go paradigm (Kuhbandner et al., 2010; Wenke et al., 2011). This is a cognitive task that requires participants to respond quickly to target (go) stimuli and to inhibit responses to 'no-go stimuli' and in a joint action condition, a co-actor would respond to stimuli in a converse way (Wright, et al., 2014). The paper by Hartmann and colleagues (2019) used a different approach. In this paper, participants were asked to complete a joint random number generation (RNG) task while standing either to the left or right of their co-actor. Three of the papers observed the synchronisation of a piece of music played by pairs of participants (Huberth et al., 2019; Novembre et al., 2019; Novembre et al., 2012). Finally, Varlet and colleagues (2014) observed movement coordination among participants asked to swing a pendulum in a synchronised manner.

3.4.3 Measure of emotional experience

All the self-report measures used do not capture the emotional experience of the participant related directly to the task, but rather they collated self-reported tendencies relating to emotional experiences whether that be levels of arousal or anxiety in the moment or empathic traits. Table 3 details which measures each paper used.

The most used measure of emotional experience was the ***Interpersonal Reactivity Index*** (IRI), a self-report measure which includes 28 items and four subscales (Davis, 1983). Five of the eleven included papers used the IRI. The four subscales of the IRI measure responses to questions in the following domains: perspective-taking (the tendency to adopt the point of view of others), fantasy (to imaginatively transpose oneself into the feelings and actions of a fictitious character), empathic concern (feelings of concern toward another person), and personal distress (self-orientated feelings of distress and unease that occur in uncomfortable interpersonal situations). The paper by authors Quintard and colleagues (2020) also used a measure based on interpersonal experiences. Participants were paired with their romantic partners and asked to complete the ***Passionate Love Scale*** (PLS) (Hatfield & Sprecher, 1986) to measure the extent to which partners took the actions and contributions of their partners into consideration during the JA task. The participants completed the 15-item version of the PLS, which provided information about the emotional, behavioural, and cognitive elements of romantic relationships.

Two other empathy-based measures were used in the reviewed papers. Firstly, two papers used the ***Empathy Quotient*** (EQ), a 60-item self-report questionnaire to measure empathy (Baron-Cohen &

Wheelwright, 2004). The EQ is a well-used standardised measure that appears to be a valid and reliable measure of empathy. In the third paper, the ***Bamberg Empathy Questionnaire*** (BEQ) (Zoll & Enz, 2005) was used by Wenke and colleagues (2011). The BEQ is like the IRI in that it conceptualises empathy as a collection of separate but related constructs (see IRI subscales outlined above) associated with spontaneously adopting another person's point of view (Davis, 1983). However, the BEQ also includes a subscale called "ideomotor empathy", which measures the inclination for the spontaneous replication of movements to occur when actions are observed (e.g., when an observer of a football game kicks their leg).

Two papers (Kuhbandner et al., 2010; Liepelt & Raab, 2020) used the ***Affect Grid*** in their research (Russel et al., 1989). The Affect Grid invites participants to express their mood state on a nine-by-nine grid of arousal (1 = low arousal/sleepiness, to 9 = high arousal) and valence (1 = unpleasant feelings, to 9 = pleasant feelings). Last of all, Varlet and colleagues (2014), used the ***Liebowitz Social Anxiety Scale*** (LSAS) (Mennin et al., 2002). The LSAS contains 24 social situations, each of which is rated by level of fear (from 0 = none to 3 = severe) and avoidance (0 = none to 3 = usually).

3.4.4 Emotions and spatial-response compatibility trials

Table 4 presents a summary of the main results of the papers that used a SRC task as an observation of JA. All four papers that used the Joint Simon Task found a Joint Simon Effect (JSE), which is consistent with previous research (Sebanz et al., 2003). The papers included in this review explored relationships between self-report measures of emotion, group type (e.g., friends vs strangers) and the extent of the JSE.

Participants in Ford and Aberdein's (2015) paper completed the Simon Task individually, with a friend and with a stranger. The Simon Task required participants to press a button in response to either a red or green ring on a computer image of a hand. The participants were assigned a colour as a target stimulus. A joint JSE was found, which means participants responded more quickly when the finger pointed towards them, rather than their co-actor. The authors found no significant effects of group which suggested the JSE did not significantly differ whether the co-actor was a friend or stranger. Participants completed the EQ and IRI. Empathy seemed to influence the performance of the pairs of friends to a greater extent than strangers. As a whole group, there was a significant correlation between scores on the 'perspective-taking' subscale of the IRI and the JSE (see Table 4). But this effect was moderated by group: the effect was greater among friends than strangers. There was no reliable correlation between JSE and either empathy measure (EQ or IRI) among the stranger pairs.

Unlike the results of Ford and Aberdein's (2016) paper, no interactions were found between the JSE and the IRI perspective-taking subscale, or any other IRI subscale but personal distress in van der Weiden and colleagues (2016) paper. This research used the Joint Simon Task with unacquainted, mixed-sex pairs of participants. Participants sat next to each other, and each participant was asked to respond to one of two colours on a computer screen. The location of the dots varied from the left to the right of the screen, to be incongruent or congruent with the participant's seat and button location. The authors emphasise caution should be exercised when interpreting the interaction between the personal distress scale and the JSE found in this paper. As, although women scored .70 higher on average on this subscale than men, the interaction between this scale and the JSE seemed to be driven just by a small sample of men (> 1 SD above the mean) who score highly on the personal distress scale.

The third study to use a version of the Joint Simon Task asked participants to complete the Simon task alone, with a friend, and then with their romantic partner (Quintard et al., 2018). Heterosexual romantic partners and mixed-sex friendship pairs were recruited, and the authors aimed to explore the concept that

love involves self-other confusion at a bodily level. The authors found a greater JSE between romantic partners than friends and the more the couples reported being passionately in love (higher PLS scores), the greater the JSE was with their romantic partner.

The fourth study reviewed that used the Joint Simon Task did not observe empathy or interpersonal-related emotions such as passionate love. Rather, the fourth study used the Affect Grid to study participants' emotions (arousal and valence), the outcomes of which were then related to the observed JSE (Liepelt & Raab, 2021). In the first stage of this study, the authors created a state of competitiveness or cooperativeness in the participants. To do so the participants were either asked to play a game against a co-actor or alongside them, in a cooperative manner. This game was unrelated to the joint Simon task but was used to induce a competitive or cooperative cognitive state in the participants. The researchers then tested the impact of this on self-other integration during the joint Simon task.

The joint Simon task followed this stage, in which participants were presented with a square or diamond shape to the left or right of a computer screen. The person to the left of the screen responded (using a button on the left side of the keyboard) to one of the shapes, while their co-actor responded to the other shape and was seated to the right of the screen. JSE was greater in the cooperative than competitive state group. Scores on the Affect Grid were not reported to be correlated with the JSE.

The fifth study induced a positive, negative, or neutral mood state in participants before they completed the Joint Simon Task (Kuhbandner et al., 2010; Sebanz et al., 2003). The mood state was induced via the presentation of a positive, negative, or neutral film clip. The success of this manipulation was assessed using the Affect Grid. A JSE was found only between participants in the neutral and positive mood conditions and not in the negative mood conditions.

TABLE 4: SUMMARY OF RESULTS - STUDIES THAT USED A STIMULUS-RESPONSE COMPATIBILITY TASK

#	Study	*N*	Joint task	Summary of the relationship between emotions and the joint task*	Outcome summary
1	Ford and Aberdein, 2015	44	Joint Simon Task	Significant correlation between the JSE and the cognitive perspective-taking subscale of the IRI (r = 0.36, p = .016). The correlation was stronger when the task was completed with a friend (compared to a stranger) (r = 0.56, p < .01). The JSE was sig. correlated with EQ scores in the friends group (r = 0.51, p < .05)	Empathic traits, particularly perspective-taking, may cause a greater JSE
2	Van der Wieden et al., 2016	130	Joint Simon Task	A repeated measures ANOVA found an interaction between the JSE and the IRI personal distress subscale (F(128, 126) = 4.30, p = 0.4) This seemed to be modulated by sex. Males scoring high on the IRI personal distress subscale had a larger JSE than males who scored low on this scale. This seemed to drive the relationship between personal distress and the JSE.	Scores on the IRI did not seem to reliably affect the JSE, that is they did not seem to modulate action interference when the JA task was performed with a co-actor. As the interaction between IRI personal distress scores and the JSE was driven by a small proportion of males who scored highly, the authors exercise caution and low confidence in the validity of these results.
3	Quintard et al., 2020	56	Joint Simon Task	A greater JSE was found in the romantic partner condition (mean JSE = 8.18ms) than in the friendship condition (mean JSE = 3.60ms). A significant positive correlation was found between scores on the PLS and the JSE in the romantic partner condition (r = 0.30, p = .028).	The participants who reported stronger love-related emotions produced a greater JSE with their romantic partner.
4	Liepelt and Raab, 2020	32	Joint Simon Task	The interaction between cognitive state and JSE was significant (F(1,30) = 4.55, $p < 0.05$). The S-R compatibility effect was significantly smaller for participants in the 'competitive state' group (9ms) than in the 'cooperative state' group (21ms). There was no relationship or interaction found between Affect Grid scores and Joint Simon Task performance.	Self-reported emotional experience was not associated with the JSE. However, participants who were encouraged to compete against their co-actor responded significantly faster on incompatible trials than those who were encouraged to cooperate with their co-actor.

5	Kuhbander et al., 2010	84	Go/No-go task	A three-way interaction between Compatibility, Task Setting (joint or individual), and Mood state was significant, $F(2, 78) = 4.7$, $p = .011$).	Results suggest the JSE depended on the mood/affective state of the participants. The JSE was only present in the neutral and positive mood condition, not the negative mood condition.
6	Wenke et al., 2011	32	Go/No-go task (Flanker task)	*No reports of statistical analysis were provided*	Participants who scored the highest on the empathy measure experience greater conflict in agent identification (determining when it is "my turn") when they performed the task with a co-actor, compared to when it was performed alone.

*Notes: statistical outcomes are given where provided in the articles. *The joint effect for the SRC tasks is calculated by subtracting mean reaction times on compatible trials from mean reaction times on incompatible trials.*

A Go/No-go task was used by Wenke and colleagues (2011) to investigate the co-representation of tasks in JA. The joint Simon tasks discussed above use paradigms that require participants to respond to a target stimulus while their partner responded to a different target stimulus; in essence, the participants were required to take turns when responding to the stimuli. To explain further, this paper used the Flanker task: participants were seated facing each other across a table. Each participant had two buttons to press (one with their left hand, the other with their right), which corresponded with two colours of target stimuli. For example, participant A would respond to blue and red circles, with the left and right buttons, respectively. Participant B would respond to yellow and green in a similar way. Three circles were presented horizontally on the table. The middle circle represented the target stimuli and the two circles at either side of this were the 'flankers'. The flankers could appear as the same colour as the target stimuli (e.g., blue), the participant's other target stimuli (intra-individual incompatible flanker condition), the co-actor's stimuli that signalled the same button-press response (inter-individual compatible) or the co-actor's stimuli that signalled a different button response (inter- individual incompatible).

Participant responses were faster when target stimuli were flankered by that participant's own stimuli colours than their co-actors or non-target stimuli (called the "own flanker advantage"). This effect is similar to that described by the JSE. The authors suggest a possible reason for this is that flankers in one's own colours might have helped the participant to recognise that it was their turn to respond to the target stimuli. For only the participants who scored the highest overall empathy scores on the BEQ, the own flanker advantage was larger in the joint task setting than when participants played alone. This relationship was also found for participants who scored the highest on the 'ideomotor' subscale. The authors proposed participants who more readily placed themselves in the shoes of their co-actors experienced increased conflict in agent identification (i.e., discriminating between "my turn" and "my co-actors turn") when completing the joint task compared to when they completed it individually. This paper, however, had limitations that resulted in a 'weak' score on the quality appraisal. The paper does not present statistical data or results or participant recruitment information. This paucity of information lessens the quality of the study and the reliability of the results.

3.4.5 Shared emotions, body location, and synchronisation

Two of the papers reviewed here used a joint task that involved the observation of a participant's bodily position or movement. First, Hartman and colleagues (2019) hypothesised that participants standing to the

left of their co-actor would generate smaller numbers than if they were standing to the right of their co-actor, as though numbers were cognitively represented along a mental number line. line. Furthermore, since the co-representation of others appears to be influenced by social phenomena and trait empathy (the authors referenced Ford and Aberdein's 2015 paper), trait empathy was measured, using the IRI, to assess the social nature of the joint effect in the task. In this experiment, 68 participants were instructed to verbally state a random sequence of numbers in the range of one to 30. Half of the participants completed the task in an individual condition and half in a joint condition. The pairs were already acquainted with each other and considered themselves either colleagues or friends. In the joint condition participants were seated next to each other and were asked to alternatingly state random numbers while ignoring the numbers given by their co-actor. After they each stated 40 numbers, they switched positions and the RNG task was repeated. Overall, the average numbers generated on the left were smaller than those generated on the right. The individual differences between the averages of numbers generated on the right and left side (*M* RNG right – *M* RNG left) were correlated with empathy scores on the IRI. A significant positive correlated was found for the IRI subscale, empathic concern. Participants were then allocated to a high or low-empathic concern group, based on their scores. Separate paired *t*-tests revealed a significant effect of body position for the high empathic concern group, but not for the low empathic concern group (see Table 6 for details).

The second paper in this section recruited participants with Social Anxiety Disorder (SAD) and used the LSAS to measure their experience of emotions such as worry and fear in social situations (Varlet, et al., 2014). SAD is associated with considerable impairment in daily functioning (Aderka et al., 2012) and social relationships (Alden & Taylor 2010). Varlet and colleagues (2014) were interested in the non-verbal social behaviours of people with SAD, as research suggests there are strong relationships between the bodily movements and motor coordination of people who interact together and their mental states (Sebanz et al., 2006). Indeed, interpersonal coordination appears to influence the success of jointly performed tasks and enhance social connectedness (Marsh, Richardson, & Schmidt, 2009). The aim of this paper was to examine whether participants with SAD experienced a disruption of social motor coordination. 19 participants with SAD were matched with 19 control participants for age, sex, and education. Participants were seated next to each other and swung hand-held pendulums forwards and backwards. They were instructed to swing the pendulum at their self-selected, comfortable tempo in one trial and were instructed to intentionally match the tempo of their co-actor in another trial. As expected, coordination was greater in the trials where participants were instructed to match the tempo of their co-actor than when they were asked to simply swing their pendulum at their own pace. Analysis showed the SAD group synchronised with their co-actors as well as the control group when the rhythmic coordination was unintentional. However, the SAD group coordinated less well when coordination was intended, and the participant was asked to lead the coordination. Of interest here is that scores on the LSAS did not correlate with the intentional or unintentional rhythmic coordination performance. It seemed the emotional experience of social anxiety did not modulate performance on this task.

TABLE 5: SUMMARY OF RESULTS - STUDIES THAT USED A BODY SYNCHRONISATION OR POSITION TASK

#	Study	*N*	Joint task	How was the joint effect measured?	Summary of the relationship between emotions and the joint task	Outcome summary
7	Hartman et al., 2019	68	Joint random number generation task	Whether participants randomly generated smaller numbers when located to the left of their co-actor and larger numbers when located to the right of their co-actor.	A significant positive correlation was found between empathic concern and how spatial position affected random number generation (RNG) (r = .370, p = .037). T-tests revealed a significant effect of body position on RNG only for participants in the high empathic concern group (those with the highest scores on the questionnaire) (t(13) = 4.26, p = .001), and not those in the low empathic concern group (t(13) = 0.24, p = .814).	A mental number line was randomly generated in the joint condition but not the individual condition. That is, smaller numbers, on average, were generated to the left of a co-actor and larger numbers to the right. This effect was driven by participants with the highest empathic concern scores.
11	Varlet et al., 2014	38	Movement task	Both the unintentional and intentional synchronisation of the tempo of a swinging pendulum was observed.	No significant correlations were found between the LSAS total scores and movement synchronisation between participants.	The unintentional synchronisation of movements was not impacted by the presence of SAD in the participants

Notes: statistical outcomes are given where provided in the articles

3.4.6 The influence of shared emotions on musical joint action tasks

Three of the papers reviewed used a music-playing joint action task using a music box activity (Novembre et al., 2019) and piano-playing (Huberth et al., 2019; Novembre et al., 2012). The co-representation of another's actions was investigated by Novembre and colleagues (2012). Participants played the right-hand part of a piano piece while the left-hand piece was either not executed or was believed to be played by a co-actor in the joint condition. The participants had previously learned to play the piece biannually. In the joint condition, the experimenter feigned playing the left side of the piano, while a pre-recorded audio played. The researchers investigated motor action co-representation by observing motor-evoked potentials (MEPs) in the participant's resting left forearm, while they played music with their right. The authors believed the activation of these muscles would reflect a somatotopic specific representation of the piece of music (which was rehearsed bi-manually prior to the task) associated when a finger on the left

hand should have played a piano key. Participants completed the BEQ at the end of the experiment. The authors found a significant positive correlation between empathy scores and the MEPS recorded during the joint session but not the individual condition.

In the second paper, participants played a six-note sequence on a piano with a partner (Huberth et al., 2019). The interaction between participants' self-reported empathic levels (measured using the EQ) and expectations of pitch outcome as they or their partner played, was investigated during a turn-taking piano duet task. Previous studies found trained pianists form expectations of pitch outcomes and when the outcome of pressing a piano key was unexpected (an altered pitch) larger amplitudes of the frontocentral feedback-related negativity (FRN) and P3 (an event-related potential that appears to be related to cognitive processes such as attention and working memory) occurred (Maidhof et al., 2010). FRN and P3 activity were recorded using electroencephalography (EEG) recording of participant's neural activity as they took turns playing the piano piece. The researchers altered the pitch of one note in each participant's part per trial, with a total of 48 trials and the altered note differed in each trial. Analyses found FRN and P3a amplitudes were larger in response to the participant's own pitch alterations (self-condition) compared to their partner's alterations ('other-condition'). In relation to emotional experience, a significant, positive correlation was found between empathy scores and FRN amplitude in the self-condition but not in the 'other-condition'. That is, higher trait empathy scores correlated with smaller FRNs in response to alterations in the participant's own musical piece.

The final paper to be reviewed explored whether empathic perspective-taking (EPT) promoted interpersonal coordination during a synchronisation task (Novembre et al., 2019). Participants were divided into a low and a high empathy group based on their IRI scores. Pairs of participants were asked to rotate electronic music-boxes, so that two streams of music were produced, with the aim of synchronising the music. Participants in the high EPT group were on average more accurate in synchronising their actions than participants in the low EPT. Participants were also given the opportunity to lead the task, while their co-actor followed. When a leader was assigned, the participants established synchronicity faster than when no leader was assigned. Furthermore, this was established faster among those in the high EPT condition.

TABLE 6: SUMMARY OF RESULTS - STUDIES THAT USED A MUSIC-MAKING TASK

#	Study	*N*	Joint task	How was the joint effect measured?	Summary of the relationship between emotions and the joint task	Outcome summary
8	Novembre et al., 2012	15	Music-making task	In the joint condition, partici- pants believed their co-actor was playing the left-side of the piano while they played the right-side. The authors proposed that the co-representation of a co-actors actions when it was time for piano keys on the left- side to be played would be ob- served in a shift in amplitude of motor-evoked potentials recorded on the resting left fore- arm of participants.	A significant positive correlation between empathy scores and the amplitude of motor- evoked potentials (MEP) recorded on the resting left-arm of participants during the joint condition was found (r = 0.619, p = 0.018), but not with the individual condition (r = 0.318, p = 0.267).	This suggests that MEP amplitude reflecting the co-actors actions (piano keys to be pressed) increased with increasing empathy scores, that is, partici- pants appeared to co- represent the motor fa- cilitation of their co-ac- tor's actions.

9	Huberth et al., 2019	18	Music-making task	Neural responses monitored using EEG recordings, to unexpected and altered pitch of piano keys heard while playing a piece of music, or when a co-actor played the piece of music was investigated. The interaction between self-reported traits of empathy and the amplitude of the neural response, that is, the performance monitoring process, was explored.	A significant positive correlation was found between empathy scores and frontocentral feedback-related negativity (FRN) amplitude in response to pitch alterations in the pianist's own part (r = .67, p < .01), but not in response to the partner's part.	Higher trait empathy was associated with smaller FRN responses to unexpected alterations in the pitch during the participant's own musical piece. This is different to what previous studies have found.
10	Novembre et al., 2019	58	Music-making task	The accuracy of the synchrony of the rotation of an electronic music-box was measured between pairs of participants. Participants were asked to complete this task under three different conditions: without a leader, as the leader, and as the follower.	A significant main effect of empathy was found (F(1,24) = 6.76, p = .02), suggesting those who scored highest on the empathy measure (high empathy group) produced smaller asynchronies (therefore were more accurate) when playing music than the low empathy group. A significant interaction was found between leadership and empathy. When a leader of the dyad was assigned, the higher empathy pairs appeared to establish synchronisation faster.	Pairs of relatively more empathic individuals were more accurate in the interpersonal synchronisation task. And when a leader was assigned, the beneficial impact of empathy emerged earlier. The authors propose that this was probably as soon as enough information about a partner's timing was available.

Notes: statistical outcomes are given where provided in the articles

4. Discussion

This review aimed to investigate the interaction between emotional experiences and joint action performance. The database search resulted in eleven empirical papers that measured the self-reported emotional experiences of participants using a variety of self-report measures. The quality appraisal process resulted in a 'weak' rating of quality for the study by Wenke and colleagues (2011). This research reported a relationship between high empathy traits and increased conflict in task responses on a joint task but not individual conditions. The findings described lend evidence towards the co-representation theory and suggest empathy influences the strength of the mental co-representation of another's actions. However, the results of this paper will not be taken further or considered in the conclusions of this review due to the lack of statistical data presented to evidence the findings.

4.1 Empathy

The most observed emotional experience in this review was that of empathy. In particular, the IRI, or rather the perspective-taking subscale of the IRI, was the most frequently used measure. First, Ford and Aberdein (2015) reported a significant relationship between the IRI perspective-taking subscale and the JSE but only among pairs of friends, not strangers. The higher the empathy scores reported by groups of friends, the more interference on the Joint Simon Task was found. A conclusion proposed by the authors is that the mechanisms underlying the JSE differed between friends and strangers. That is, the friends-pairs were influenced more by social processes than the stranger-pairs and therefore performances on joint tasks may be influenced by how well co-actors know one another.

In comparison, Hartman and colleagues (2018) also paired friends together to complete a task but they did not find that higher perspective-taking scores on the IRI correlated with greater spatial compatibility (i.e., the mental number line) on the RNG task. However, participants were explicitly asked not to work together on the RNG task, whereas participants were actively encouraged to collaborate on the Joint Simon Task. This encouragement and difference in style of collaboration may influence whether attention is given to a co-actor's task actions, which in turn may be influenced by empathic traits, such as perspective-taking, which was discussed in Ford and Aberdein's paper.

Another empathic trait measured by the IRI is empathic concern. Scores on this scale were associated with a greater spatial compatibility effect when participants completed the RNG task a familiar co- actor (Hartmann et al., 2018). The authors suggest these results cannot be explained by co-representation as there was no priming of the co-actor's action or conflict due to a mirroring of the motor mechanisms involved in a co-actor's action (as may be the case in the JSE). Rather, the authors propose spatial reference coding is a key factor underlying the joint compatibility effects found, that is the mental number line generated between participants (i.e., smaller numbers to the left, larger to the right). Finally, the influence of relative body position on RNG was largely driven by the participants with the highest self-reported empathic concern towards other, which seemed to boost the spatial coding of one's location relative to others. These participants may have had a greater tendency to mentally construct a common representational space between themselves and others.

The third subscale of the IRI that was included in the reviewed papers was the personal distress scale. Ford and Aberdein did not find the personal distress subscale to be related to the JSE but van der Weiden and colleagues (2016) did, and this was driven by a small sample of male participants who scored particularly highly on this scale. Therefore, the authors conclude that their hypothesis was not reliably confirmed and suggest an interpretation of this outcome. They suggest that although those who score highly on the personal distress scale may have difficulty distinguishing between self and others' emotions (Lamm et al., 2007) but not actions, particular actions that are not salient but neutral, as in this experiment.

Wenke and colleagues (2011) proposed that if the interference effects found in joint action settings (such as the JSE) are due to task co-representation between co-actors, then response times should be slower when a co-actors stimuli are presented that are spatially incompatible with a participant's target response compared to if the stimuli are spatially compatible. In their paper, empathic traits appeared to be associated with greater response-interference on the joint Flanker task which they suggested was due to greater co-representation of the co-actor's actions (Wenke et al., 2011). However, confidence is limited in the reliability and validity of the results of this experiment due to the lack of design and results information reported.

The three musical JA task papers asked participants to complete self-report measures of empathy. Novembre and colleagues (2012) found a significant positive correlation between empathy scores and MEPS recorded in the resting left forearm of the participant while they played the piano with their right hand in the joint condition. Thus, participants with higher self-reported empathy scores had higher MEP amplitudes, suggesting they also had a stronger representation of the actions of their co- actor, in the social, joint condition. In the second musical JA task paper, a significant positive correlation was found between empathy scores and neural activity in response to unexpected pitch alterations during the participant's own piano piece, but not during the co-actor's piece (Huberth et al., 2019). This finding was different to what previous, similar research has found. Finally, the third musical JA task found a relationship between higher empathy scores and better, more accurate synchronisation of electronic music boxes (Novembre et al., 2019).

4.2 Romantic emotions

The Passionate Love Scale was used to record romantic, loving emotions between romantic partners in Quintard and colleagues (2018) paper. It was hypothesised that there would be reduced discrimination between the mental representations of one's own and one's romantic partner's actions during the joint Simon Task (which would result in greater JSE). The results seemed to confirm the hypothesis and the authors concluded that a higher conflict and less discrimination, between one's own and an- other's actions was present between the romantic partners than in the friendship pairs.

4.3 Emotional arousal, valence, and anxiety

The Affect Grid was used to record the emotional experience of participants in the moment, during the JA task in Liepelt & Raab's (2021) study. While scores on the Affect Grid were not reported to be correlated with the JSE, the scores on the arousal measure of the Affect Grid were significantly lower following the competitive state game to the scores following the cooperative state game (which took place in between trials on the Joint Simon Task). The authors suggest lower arousal levels after the competition game might, in fact, have been a modulating factor that contributed towards the differences in the size of the JSE between the competitive and cooperative state conditions. However, this research did not explore this relationship further. The emotional valence or mood state of participants was manipulated using film clips before participants completed the Joint Simon Task in Kuhbander and colleagues (2010) paper. The JSE was strongest after the positive affect condition and absent fol- lowing the negative affect condition. The authors suggest that emotional experience can create differences in the automatic co-representation of a co-actor's actions. One paper recruited participants with Social Anxiety Disorder (Varlet et al., 2014). This paper did not find an association between self-reported experiences of social anxiety and the movement synchronisation task.

4.4 Methodological considerations and limitations

Many of the reviewed papers recruited student participants using opportunity sampling yet there was limited discussion or acknowledgement of how recruitment and sampling processes may have reduced the generalisability of the results. For instance, none of the included studies recruited a wide age range of participants, yet studies have found a significant decrease in empathic traits as people age (Schieman & van Gundy, 2000).

To what extent the familiar dyads of participants were emotionally connected was reported in just one paper (Quintard et al., 2020). There was a lack of measurement of how emotionally connected or empathetic the participants were feeling towards each other, either prior to or following the JA tasks.

Therefore, all but the research by Quintard and colleagues did not consider the potential differences between emotional connectedness and empathic concern for colleagues or new friends compared to older, closer friendships.

The inclusion criteria were set so that only experimental design papers were reviewed. This precludes the applicability of the review findings to more every day, natural collaborative social interactions. However, the inclusion criteria were set as such to mirror the tendency of JA research to take an experimental design format.

4.5 Conclusions and future directions

Numerous JA studies identified during the screening stage of this literature review included feedback conditions to attempt to induce a particular mood state in participants (such as Balconi et al., 2018; Monster et al, 2016). However, they did not assess the success of this manipulation using self- report measures, such as Kuhbander and colleagues (2010) did, and therefore did not meet the inclusion criteria for this review. The manipulation of mood state via feedback may enable the investigation of a collective emotional experience that occurs during a JA task, perhaps as a consequence of interacting together (e.g., shared frustration following negative task feedback). To date there is little exploration of collective/group emotional experience in JA compared to individual experiences (Salmela & Nagatsu, 2016). Upon reflection of the present review, it is apparent that to broaden the inclusion criteria in such a way to include research that manipulated affective states could provide a more thorough overview of the position of the research into collective emotional experiences during collaborative tasks.

Finally, the influence of emotional experience, particularly empathic concern, or perspective-taking on JA among well-established and connected relationships compared to new friendships was explored in this review. This review found emotional experiences such as empathy to interact with JA tasks more strongly among familiar dyads than unfamiliar dyads. To summarise, the greater empathic traits reported by participants, particularly perspective-taking; 1) the more synchronized participants tended to be in tasks that required physical coordination and, 2) the more interference that appeared to be created by the presence of a co-actor during SRC tasks. The latter finding may be explained by the theory of co-representation. While co-representation of a co-actors goals and actions may negatively impact performance on tasks such as the Joint Simon Task, in a therapeutic dynamic co-representation may in fact have positive outcomes. For instance, the co-representation of the client's goals and intended actions by the therapist may increase alliance and attunement between therapist and client. The interactions found in this review between the 'closeness' of relationships and empathy on collaborative task outcomes may reflect what typically occurs between therapist and client. That is, that longer lasting and more empathic therapeutic relationships tend to result in greater therapeutic benefits and outcomes (Lambert & Barley, 2001).

5. References

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Chapter 2: Empirical Report

An investigation into the relationship between climate change anxiety and attitudes towards climate actions

Abstract

Background: The ecological crisis and the warming of the climate is a threat to all life on earth. A growing body of research suggests people are experiencing climate related worries and anxiety while at the same time individuals are encouraged by pro-environmental organisations and governments to engage in climate actions, to help reduce climate change.

Method: Three research questions were asked of data collected via an online questionnaire; 1) how anxious were the local population about climate change? 2) what expectations does this population have of themselves and others with regards to climate actions, and 3) what attitudes does the population hold around the rewilding of private and public spaces as a climate action?

Results: The local population were significantly less anxious about climate change than other populations that reported using the CCAS. Interactions between age and gender were found on CCAS scores and climate action-related variables.

Discussion: The youngest age groups reported experiencing more climate anxiety and the oldest re- ported feeling less, a finding that is supported by existing research. CCAS scores correlated positively with the agreement that the public should make more lifestyle changes to reduce climate change. Interestingly, the agreement was stronger on this measure than for expectations of the wealthiest or most powerful in society. Finally, participants tended to be in favour of rewilding features of gardens and public spaces.

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) states that if we are to secure a liveable future and limit the warming of the planet, the time for action is now (IPCC Press Release, 2022). Last year, in November 2021, the UK hosted the 26th United Nations Climate Change Conference of the Parties (COP26). Almost 200 countries agreed to the Glasgow Climate Pact (COP26, 2021). COP26 created a pact to "speed up the pace of climate action", a term used to describe activities and actions taken to limit and reduce the planet's warming. The pact emphasises the necessity for collective action be- tween countries to limit global warming and support those already affected by the devasting consequences of climate change (e.g., consequences such as changing weather patterns that can cause droughts and impede harvests). The ecological crisis caused by rising temperatures threatens all life on earth (IPCC, 2018).

The Association of Clinical Psychologists (ACP-UK) refers to the concept of "shared trauma" to describe the psychological impact of these threats, what we stand to lose and what we have already lost because of climate change (Morgan, Snell, & Randall, 2020). The ACP are not alone in calling out the impact of climate change on psychological health and physical health and safety. Climate change-related disasters can cause psychological trauma and shock because of personal injury, death of a loved one, or loss of property or livelihood, for example (Clayton et al., 2017). The more gradual and chronic changes because of climate change are resource scarcity (Mushavi et al., 2020), migration and displacement (Cattaneo et al., 2019), and conflict (Koubi, 2019), which can also have significant effects on mental health. The effects of climate impact on mental health will vary depending on a person's geographical location, whether that is more vulnerable to the direct impacts of the rise in temperatures, and how well-resourced and protected a population is (Cianconi et al., 2020). Yet, despite these moderating factors, the ecological crisis may have some detrimental effects on the emotional and psychological well-being of the global population, particularly in the form of an anxiety response (Clayton, 2020). Climate change anxiety (CCA) as a phenomenon can be defined as a negative emotional, behavioural, and cognitive response to concerns about climate change (Schwartz et al., 2021).

Psychologists and mental health professionals wish to respond to the call for support or interventions to help those who are psychologically impacted by the ecological crisis (Wainwright & Mitchell, 2020). Change is coming, whether that be detrimental to our way of life due to the damaging impacts of climate change or from suggested lifestyle changes made to the public to reduce their individual impact. For change to occur, individuals and collective groups need to shake our feelings of hopelessness and implicit denial about the scale of the ecological crisis and the actions that need to be taken (Huxley & Lambrick, 2020). While agreements such as the Glasgow Climate Pact (COP26, 2021) identify significant actions that governments agreed to take, the public and individuals can take steps towards reducing their impact on the ecological crisis. Individual, personal actions can help to reduce greenhouse-gas emissions, which must be reduced by half by 2030 to preserve a liveable climate (United Nations Environment Programme, 2020). 'Ten Impactful Climate Actions' are recommended by the UN with a corresponding mobile phone application individuals can use to encourage themselves to take climate actions including changes to how they travel, use energy, and what they eat and buy (United Nations, Act Now: Start with these Ten Actions, 2020). Finally, at the time of writing this research, the UK public was invited to participate in "The Big Plastic Count" (Greenpeace, 2022). This week-long investigation into how much plastic each UK household uses is to be used as evidence to push the government and large companies to do more to reduce the amount of plastic that is created and used.

The UK population are encouraged by many organisations to take personal actions, to change their lifestyles in line with climate actions and agreements made by governments at events such as COP26. How does this encouragement and implied responsibility affect the emotional responses the public have to the climate crisis? Research suggests that if climate actions are proposed in line with the existing values and attitudes of the public, they are more likely to be well-received (CAST, 2022). Indeed, the UK Committee on Climate Change published a report that suggested individuals may be more amenable to climate action changes that not only reduce the effects of climate change but also improve public health and benefit the natural environment (CCE, 2020). Furthermore, there are models of behaviour change that could be used to further examine the factors that can influence a person's behaviour. One such model is the Health Belief Model (HBM). The HBM focuses on the beliefs of individuals that can shape health behaviours (Glanz et al., 2008). The HBM is a well-established theoretical framework that attempts to predict a person's likelihood of engaging in healthy behaviours. This is based on a person's perceptions of the benefits, barriers, and threats. Although originally and mostly used to predict health-promoting behaviours, the HBM has been applied as a predictive measure of pro-environmental behaviours (Kim & Cook, 2021; Heimlich & Ardoin, 2008). This project explores elements of this model and how they interact with each other, such as a) whether a person believes they are susceptible to the climate-crisis threat, b) that this threat would have severe consequences, c) their belief that they are able to engage in preventative action (Akompab et al., 2013).

1.1 Climate anxiety

While anxiety is a rational response to the ecological crisis, considering the devastating effects on life (Ojala, Cunsolo, Ogunbode, & Middleton, 2021), the toll this can take on a person's psychological health cannot be dismissed. Research suggests that there is evidence of a relationship between climate change and an increased number of suicides (Cruz et al., 2020) and an exacerbation of mental distress (Rataj, Kunzweiler, & Garthus-Niegel, 2016).

Some researchers have asked whether anxiety and associated worry can be constructive. Anxiety and worry have typically been researched from a clinical perspective, and most often, these emotions are associated with adverse outcomes for one's well-being (Taylor, 2020). However, although anxiety and worry can have a detrimental impact on a person's well-being, they may also serve as motivational forces that catalyse climate actions (Ojala et al, 2021). Indeed, a growing body of research has explored the relationship between climate anxiety and climate action (Stanley et al., 2021). This relationship is frequently documented in the media (Peterson, 2021). A narrative review of the research on anxiety and climate change suggests one's self-efficacy, that is a person's belief in their own abilities, taken from Bandura's (1994) writings plays a role here (Ojala et al., 2021). Studies have found large positive correlations between climate change concern and self-efficacy beliefs which suggests that individuals who feel more concerned about climate change also feel more confident about their abilities to take climate actions (Kellstedt et al., 2008; Milfont, 2012). However, other research has found that young people in particular feel affected by climate-related distress and a sense of low self-efficacy or ability to make a difference (Baldwin et al., 2022). It seems younger people report feeling little control over the actions taken by governments and people in power whom they feel are responsible for reducing the increases in temperature and for following agreements such as the Glasgow pact (COP26, 2021). A global survey published in 2021 found that 59% of respondents (aged 16 to 25 years) were very or extremely worried and 84% were at least moderately worried about climate change (Hickman et al., 2021). This survey also reported that more than 45% of the young people who responded found their feelings about climate

change had a negative impact on their daily life and functioning. Additionally, most responders reported feeling dissatisfied and betrayed by government responses to climate change.

Other research supports the findings of this survey. Young people tend to score more highly on measures of climate anxiety than older age groups (Clayton & Karazsia, 2020a; Wullenkord et al., 2021) and women tend to report more climate anxiety than men (Wullenkord et al., 2021). The measure of climate anxiety used in this research was the Climate Change Anxiety Scale (CCAS) (Clayton & Karazsia, 2020). Research has reported higher CCAS scores to be significantly associated with Generalised Anxiety Disorder symptoms (Schwartz et al., 2021), and depressive feelings (Mouguiama-Daouda et al., 2021). In younger people psychological distress was found to be associated with climate anxiety, as reported using the CCAS (Reyes et al., 2021).

1.2 Rewilding

Increasing global temperatures are creating challenges for natural ecosystems (Perino et al., 2019). One climate action that individuals can take to support biodiversity is to rewild both private and public areas. Rewilding can mean a range of things but at its essence it is a conservation activity aimed at increasing or maintaining biodiversity while reducing the impact of human activity on the area (Lorimer et al., 2015). Rewilding projects can be met with varied responses that reflect public attitudes. Thus, the values of the local population need to be considered when rewilding projects are proposed, to increase the acceptance of such changes to the local area (Bauer & Von Atzigen, 2019).

The Centre for Climate Change and Social Transformations (CAST) suggest the diverse values which exist within different groups in society need to be understood and for social transformations in the four areas listed to be done so in line with these values (CAST, 2022). CAST also suggest that if proposed actions to protect the climate could provide health, social and financial benefits in line with the values of society, then the actions are more likely to motivate behaviour change and policy change.

1.3 The present study

The present project proposes three research questions and used an exploratory research design:

First, how anxious are the Leicester public about climate change, and how does this relate to demographic factors? To the best of my knowledge, this is the first project to report on CCAS scores in a UK- based population. The relationship between self-reported climate anxiety and socio-demographic variables, such as age and gender, will also be explored. This inquiry into the role sociodemographic factors have on climate change-related beliefs and actions may help to identify the groups of people most at risk of experiencing climate change-related distress.

Second, which groups within this population most believe they ought to take personal actions against climate change and/or believe those with greater power within society should do more? How might this relate to climate anxiety?

The third question asked in this project addresses what attitudes members of the public hold towards the personal action of rewilding their private or public spaces, and how these attitudes might relate to demographic factors. Rewilding is a potentially climate-affecting action that can be taken on an individual (private space) as well as on a collective (public space) level. Whether participants' attitudes are related to their experience of climate anxiety will also be investigated, as previous research has found positive correlations between climate anxiety and pro-environmental intentions (Wullenkord et al., 2021).

2. Method

2.1 Design

The current research was part of a larger project designed to explore the opinions of the Leicester- shire public, on the re-wilding of private and public space, and on the climate crisis. This larger project aimed to collate this data as evidence to support a funding application for a Mutualistic cities project, the aims of which were to create a series of research projects that explored how the public could be encouraged to support nature within urban and rural environments. The study was approved by the University of Leicester Ethics Committee (Appendix F).

2.2 Participants

1028 participants were recruited via social media advertisements. Of the participants, 789 identified themselves as female (76.8%), 225 as male (21.9%), 6 as non-binary (0.6%), and 8 participants selected the "prefer not to say" option. There was an option to select "Other", but no participant selected this. The age brackets of the participants ranged from 16-17 years (1.1%) to 80-84 years (0.8%). Forty percent of participants were aged 30 to 49 years old and another 40% of participants were aged 50 to 69 years old. As the number of responders in each age bracket varied considerably (with some containing very few participants), the questionnaire age brackets were collapsed into four approximately equal-sized categories: under 35 years old, 35-45, 45-55, 55 and over. Most participants recorded their ethnicity as White: British (876, 85.2%); many other ethnicities were recorded in smaller numbers e.g., Asian (4.5%), Black Caribbean (2.3%).

The participants were also asked to share their annual household income, housing situation and post- code area. The median household income was between £20,000 and £40,000 per year (this was reported using income brackets, not precise figures). Most of the participants lived in a property owned by someone in the household either with a mortgage to pay or without a mortgage to be paid. The postcodes were from various places across the county. These details were requested as particular attitudes towards re-wilding and climate emergency may be associated with the socioeconomic resources available to the individual. For all demographic data, participants were given an "I prefer not to say" option.

Participants were invited to provide their email addresses at the end of the questionnaire to be entered into a prize draw to win £25 High Street Vouchers and 780 participants entered the draw.

2.3 Measures

The questionnaire contained 36 sets of questions, some of which contained several items. The questionnaire included both published measures and novel, bespoke sets of questions created by the researchers for the purpose of the Mutualistic Cities project. The Mutualistic Cities research team were multidisciplinary (including psychologists and geographers). Thus, the novel questionnaire items were informed by various existing questionnaires and theoretical understandings of the relationship between individuals and nature, such as the Nature Connection Index (Richardson et al., 2019). The current research did not explore all 36 questionnaire items but rather focused on the items summarised below that were related to the research questions.

2.3.1 Climate anxiety measures

The Climate Change Anxiety Scale (CCAS) (Clayton and Karazsia, 2020) was used to measure climate-related anxiety. The CCAS was developed as a measure of anxious responses to the climate change crisis. Each of the 13 items is scored on a five-point Likert scale (1 = never, 2 = rarely, 3 = sometime, 4 = often, 5

= almost always). The CCAS includes two subscales. First, the Cognitive-emotional impairment subscale (items 1 to 8) measures how thoughts about climate change impact emotions and one's ability to concentrate (e.g., thinking about climate change makes it difficult for me to sleep). The second subscale measures Functional impairment (items 9 to 13). This asks the participant to report how thoughts and emotions about climate change might interfere with their daily tasks (e.g., my concerns about climate change undermine my ability to work to my potential).

However, item eight, "I think, why do I react to climate change this way?", was omitted from the CCAS scale when the original project questionnaire was designed. Therefore, the score on the C_E subscale was calculated as the mean of items one to seven; the mean of items nine to thirteen was calculated as the Functional Impairment score. The overall CCAS score was the mean of all 12 items. The omittance of item eight did not seem to impact the validity of the CCAS. Cronbach's alpha reliability scores were calculated for the overall CCAS score of .89, the Cognitive-Emotional impairment subscale at .87, and the Functional impairment subscale at .79. The Cronbach's Alpha scores were similar to those found in other, published research.

2.3.2 Climate crisis beliefs and action imperatives

The following climate crisis/action related items were created by the researchers for the purpose of the larger project this current project stems from. First, the participants were asked if they believed climate change was real (Q27) and if the ecological crisis was real (Q28). Both questions were answered on a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). Participants were also asked if they believed climate change was a result of human activity and if they believed it would pose a threat to the people of Leicestershire within the next thirty years.

Second, agreement on numerous climate change related positive and harmful actions were collected over three sets of questions (Q31, 32, 33) which were created by the questionnaire writers. For this present research, a selection of these items was divided into two variables. The first variable collated items related to beliefs around what 'Others' should do to protect the environment or have done to harm the environment. Here, the term 'Others' refers to those with power in society such as the wealthier members of society and companies (e.g., "the rich and powerful are preventing effective solutions to climate change"). The second variable contained items that began with "people should" (e.g., "people should avoid travel by plane" and "people should reduce the number of things they buy in the interests of the climate"). In this instance, "people" was expected to be inferred to mean oneself and the public., and thus this second variable can be used to explore participants' beliefs around what actions they feel they and others like them should take.

Additionally, participants were asked to rate whether they agreed or not on a seven-point Likert scale with the statements "The chance to tackle the climate/ecological crisis has passed and it is too late to make a real difference now" (Q31.2) and "Recycling is important to combat climate change" (Q33.1). Reported agreement and disagreement with these statements were explored in relation to other measures, with a particular focus on the attitudes towards what 'Others' have done to harm or protect the environment and what 'People' or oneself could do to protect the environment.

2.3.3 Re-wilding measures

A series of questions were created to capture not only the attitudes towards the re-wilding of private and public spaces, but also the barriers that prevent people from re-wilding their spaces. Question 17 asked participants to report if they had a particular nature-positive garden feature and whether they liked each

of the 11 features (e.g., “a lot of wildflowers and/or weeds”, “long, unmanaged grass”, and “at least one natural boundary such as a hedge”). Question 21 asked participants how they would like their garden to be (e.g., “suitable for children and/or pets” or “secure/private”).

Question 22 listed 12 items as potential barriers to re-wilding (e.g., “ensuring access and use of the garden to people with limited mobility”). Participants rated whether each item was a barrier on a seven-point Likert scale from one (not a barrier at all) to seven (a huge barrier).

3. Results

3.1 Preliminary analysis

SPSS version 28 (IBM Corp, 2021) was used to analyse the collected quantitative, questionnaire data. Reliability was assessed by estimating Cronbach’s alpha coefficients for each measure used. Descriptive statistics of the pre-existing published measured used are presented in Table 1. Correlational analyses between all main variables used to answer each research question are presented in Table 2. To answer the first research question, preliminary analyses were completed to explore CCAS scores and correlational relationships between the CCAS and other variables, which included a correlational analysis (Table 2).

Following this a series of ANOVAS and t-tests were conducted to examine any differences between groups of participants, categorised by various socio-demographic qualities, climate anxiety. To investigate the second research question ANOVAS were conducted on items that explored participants’ expectations of others and themselves, with age and gender as independent variables. The third question, regarding attitudes towards re-wilding, was investigated via a series of ANOVAS and correlations.

Many variables were found to be non-normally distributed, raising questions about the use of parametric statistical tests, although the relatively large sample brings in the mitigating considerations of the Central Limit Theorem. Other assumptions of parametric statistical tests were also violated for some tests (e.g., homogeneity of variance for some t-tests). Bootstrapping of statistical tests was employed where possible. Employment of multiple tests using null hypothesis significance testing increases the risk of Type 1 errors. Bonferroni corrections were not employed where tests followed from specific hypotheses (Armstrong, 2014), although were applied where post hoc contrasts were conducted comparing specific pairs of groups. However, effect sizes are reported and emphasised throughout.

TABLE 1: DESCRIPTIVE STATISTICS OF EXISTING, PUBLISHED MEASURES USED (N = 1028).

Variable	Items	*M*	*SD*	Min	Max	Skew- ness	Kurtosis	α [95%CI]
CCAS	12	1.67	0.61	1	4.42	1.13	1.23	.89
Cognitive-emotional impairment subscale	7	1.74	0.68	1	4.86	1.06	1.19	.87
Functional impairment subscale	5	1.56	0.63	1	5	1.43	2.34	.78

TABLE 2: SPEARMAN CORRELATIONS FOR ALL VARIABLES EXPLORED IN THE PRELIMINARY ANALYSIS CORRELATED WITH CCAS TOTAL AND SUBSCALE SCORES

Variable	1. CCAS score	2. Cognitive-emotional impairment subscale	3. Functional impairment subscale
1. CCAS score	-		
2. Cognitive-emotional impairment	.953**	-	
3. Functional impairment	.847**	.660**	-
4. Age	-.209**	-.197**	-.173**
5. Household income	-.016	-.021	-.006
6. Expectations of "Others"	.230**	.222**	.188**
7. Expectations of "Self"	.412**	.386**	.346**
8. Number of pro-nature garden features	.036	.043	.014
9. Number of barriers to the re-wilding of a private garden	.114**	.090**	.126**
10. Preference for pro-nature features in public spaces	.249**	.247**	.177**
11. "Climate change is real"	.281**	.268**	.220**
12. "Climate change is related to human activity"	.220**	.215**	.160**
13. "Climate change will present significant threats to people in Leicestershire within the next 30 years"	.261**	.263**	.191**
14. "The ecological crisis is real"	.265**	.260**	.195**
15. "The ecological crisis is related to human activity"	.238**	.231**	.182**
16. "The ecological crisis will present significant threats to people in Leicester-shire within the next 30 years"	.244**	.250**	.168**
17. "The chance to tackle the climate/ecological crisis has passed and it is too late to make a real difference now"	.083**	.081*	.070*
18. "Recycling is important to combat climate change"	.004	.029	-.045

*Note. N = 1028 (for all but Age, Number of pro-nature features, and Barriers to re-wilding variables) *p<0.05, **p<0.01.*

3.2 The Climate Change Anxiety Scale

The mean CCAS score of the whole sample was M = 1.67 (SD = 0.61) and the median was 1.55 (Q11.17 – Q32.00), suggesting that on average the participants reported low levels of climate anxiety. The item responses of one and two on the Likert scale signify "never" and "rarely" responses to the climate anxiety-related items. The Cognitive-emotional impairment subscale mean was 1.74 (SD = 0.68), and the Functional impairment subscale mean was 1.56 (SD = 0.68).

The skewness of the mean total CCAS scores was found to be 1.13, indicating the distribution was left-skewed (see Appendix H). The kurtosis of CCAS scores was found to be 1.23, which indicates the data were not normally distributed. Similar findings were reported in previous research (Wullenkord et al., 2021).

3.2.1 CCAS in comparison to existing research

This score was compared to published papers that have validated the CCAS across different populations. Comparisons with existing published CCAS data were completed using bootstrapped single-sample t-tests. The published, reported means were used as test values. To test for significance at the 0.05 level the bootstrapped 95% confidence intervals of mean difference were assessed. The analysis revealed the mean CCAS score for this project was significantly lower than the mean CCAS scores published by three studies that validated the CCAS in three different populations; the results are presented in Table 3. The three studies were chosen as they were the only available research papers that provided detailed CCAS results data to compare against, at the time of writing.

TABLE 3: MEAN COMPARISONS WITH PUBLISHED CCAS PAPERS

Study	*M*	SD	N	Age (mean)	Age (range)	Country
This project	1.67	0.61	1028	*M* = 35-45*	16-17 to 80-84*	England
Reyes et al., 2021	2.38	7.7	433	*M* = 20.4, *SD* = 1.6	18 to 26	Philippines
Wullenkord et al., 2021	1.81	0.82	1011	*M* = 43.91, *SD* = 13.97	18 to 69	Germany
Feather & Williams, 2022	1.62	0.62	771	*M* = 33, *SD* = 11.85	18 to 81	Australia and New Zealand

** The participants were not asked to provide a specific age but were asked to select an age bracket*

3.2.2 Climate anxiety and socio-demographic variables

Age and Gender - Descriptive statistics for age and gender are presented in Figure 1. Males scored the lowest, on average, on each element of the CCAS and the Non-Binary group scored the highest. However, the Non-Binary group size was considerably small compared to the male and female groups. Such unequal sample sizes may result in low statistical power; therefore, the non-Binary group were not included in further statistical analysis.

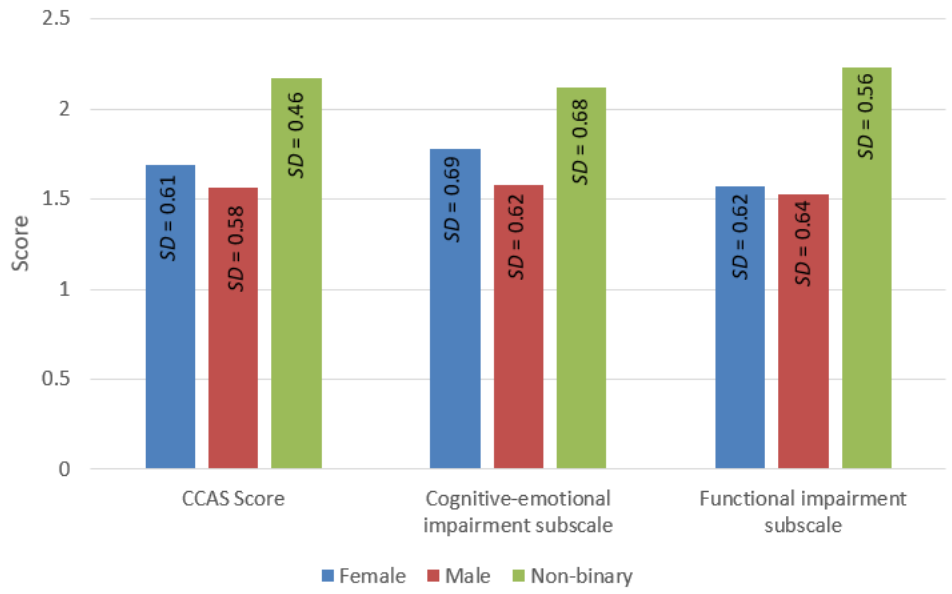

FIGURE 1: DESCRIPTIVE STATISTICS OF CCAS SCORES BY GENDER

A two-way ANOVA revealed a statistically significant interaction between age and gender (F(3,1005) = 3.54, p = 0.14; ηp2= .010) on total CCAS scores. Significant main effects of both age (F(3,1005) = 10.18, p <.001; ηp2 = .030) and gender (F(1, 1005) = 4.43, p = .036; ηp2 = .004) on total CCAS scores were also found. Figure 2 shows the pattern of this interaction. The oldest age group for both male and female participants scored the lowest on the CCAS. The youngest male participants scored considerably lower than the youngest female participants, who scored the highest out of all groups. Interestingly, male participants reported more climate anxiety in the mid-range age groups than at any other age. Additionally, at this point, they scored higher than the females of the same age group.

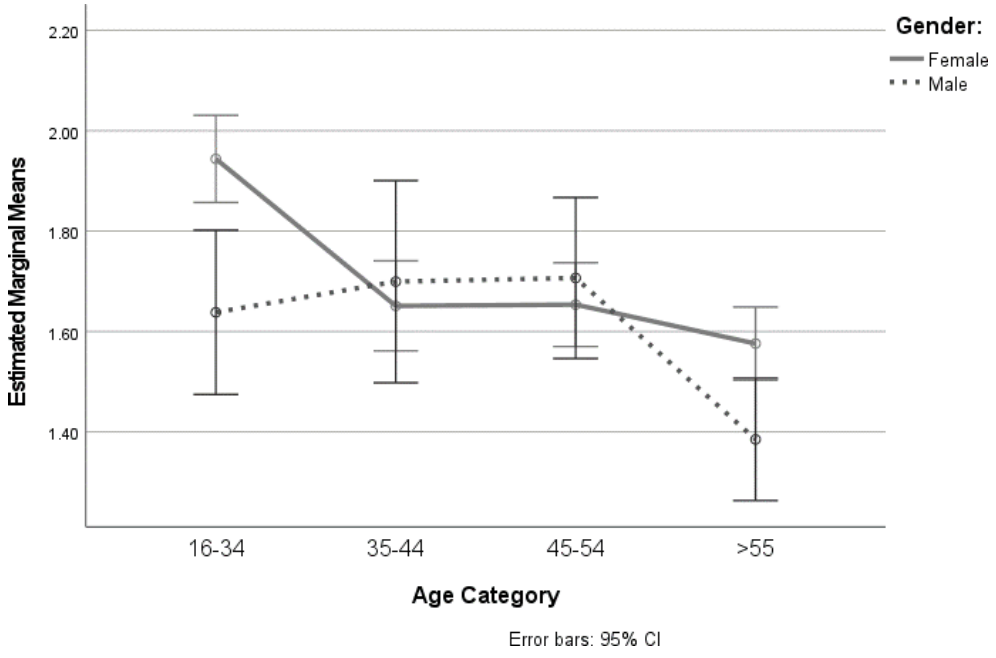

FIGURE 2: INTERACTION PLOT SHOWING A SIGNIFICANT INTERACTION BETWEEN GENDER AND AGE VARIABLES ON CCAS SCORES

There was a significant interaction between age and gender on the Cognitive-emotional impairment

subscale (F(3,1005) = 2.82, p = .038; ηp^2 = .008) and but not for the Functional impairment subscale (F(3,1005) = 3.71, p = 0.11; ηp^2 = .011). A main effect for age was found for both the Cognitive-emotional (p < .001; ηp^2 = .028) and Functional impairment subscales (p < .001; ηp^2 = .021). However, gender had a significant effect only on the Cognitive-emotional impairment subscale scores (p < .001; ηp^2 = .010). Post-hoc tests for age revealed significant differences between the total CCAS and subscale scores of participants in the Under 35 category compared to all other categories, see Figure 3 for means of each age group.

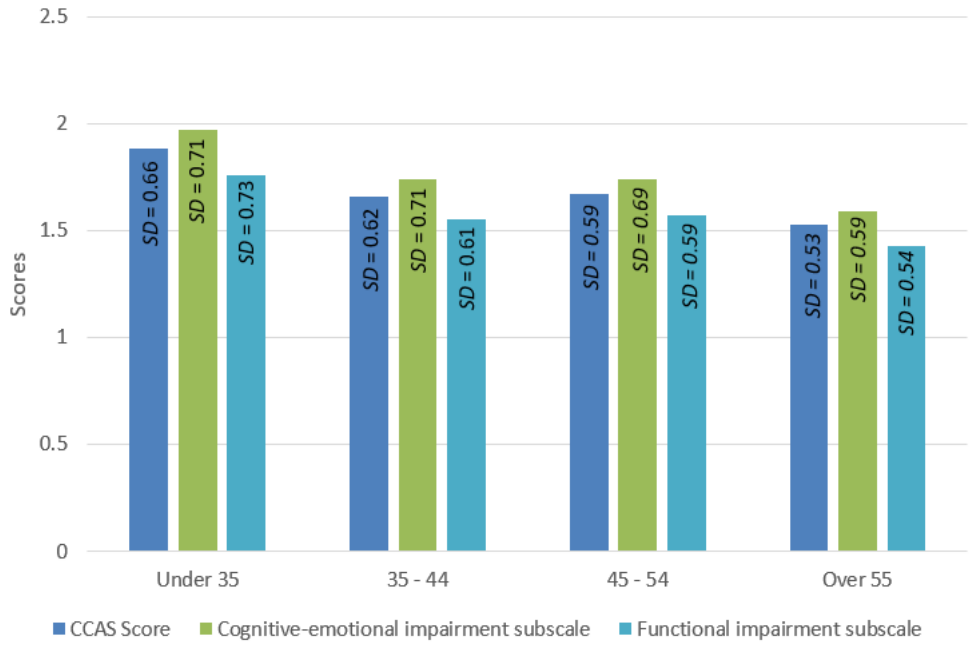

FIGURE 3: CCAS MEAN SCORE AND STANDARD DEVIATIONS OF EACH AGE GROUP

Income - There was no reported correlation between household income and CCAS total or subscale scores. Non-parametric Kruskal-Wallis H tests revealed no significant difference between household income and total CCAS score (H(5) = 8.64, p = .124), the cognitive emotional impairment subscale (H(5) = 9.46, p = .0.92), or the functional impairment subscale scores (H(5) = 8.34, p = .139).

Ethnicity - Similarly, no significant difference was found between ethnicity and CCAS total scores (H(12) = 15.74, p = .203), the cognitive emotional impairment subscale (H(12) = 14.24, p = .286), or the functional impairment subscale scores (H(12) = 17.21, p = .142).

3.2.3 Climate anxiety and beliefs about climate change

Descriptive statistics for participant responses to questions about climate change and the ecological crisis (Q27 and Q28) are presented in Table 4. The average score on all six items was around the 'strongly agree' response on the questionnaire (between six and seven). This indicates most participants agreed that both climate change and broader ecological crises are real, related to human actions, and will threaten their way of life. All six items were significantly positively correlated with total and subscale CCAS scores (see Table 2).

For Q27 (*"climate change is real"*), the interaction between age and gender was investigated, using ANOVAS with age and gender as independent variables. No significant interaction between age and gender was found ($F(3,1005) = 2.58$, $p = .052$; $\eta p^2 = .008$). However, a simple main effect was found for age ($p < .001$; $\eta p^2 = .017$). Post-hoc tests revealed participants in the Over 55 category ($M = 6.47$, $SD = 1.22$) reported significantly lower scores and therefore less agreement with the statement "climate change is real", compared to the Under 35 ($M = 6.79$, $SD = 0.88$) and 35-45 ($M = 6.72$, $SD = 0.91$) age groups.

A significant interaction between age and gender was found for Q27.2 (*"climate change is related to human activity")* ($F(7,1005) = 4.23$, $p = .006$; $\eta p^2 = .012$) and a main effect of age was found ($p = .010$; $\eta p^2 = .011$). Males in the Over 55 group reported significantly lower levels of agreement with this item than all other age groups, yet in sharp contrast to this, males in the 45-55 category reported the strongest agreement. Figure 3 illustrates this interesting interaction pattern. No interaction effect between age and gender was found for Q27.3 (*"climate change will present significant threats to people in Leicestershire within the next 30 years*") ($F(3,1005) = 1.99$, $p = .114$; $\eta p^2 = .006$). But there was a main effect of gender ($p = 0.45$; $\eta p^2 = .004$): females scored significantly higher ($M = 6.31$, $SD = 1.22$), indicating more agreement with the statement than males ($M = 6.05$, $SD = 1.43$). No significant interactions or main effects of age or gender were found on the three Q28 variables relating to the ecological crisis.

TABLE 4: DESCRIPTIVE STATISTICS FOR QUESTIONS 27 (CLIMATE CHANGE BELIEFS) AND 28 (ECOLOGICAL CRISIS BELIEFS)

Variable	*Mean*	*SD*	*Median*	Q_1-Q_3
Q27.1 Climate change is real$_A$	6.64	1.04	7.00	7-7
Q27.2 Climate change is related to human activity$_A$*	6.55	1.05	7.00	7-7
Q27.3 Climate change will present significant threats to people in Leicestershire within the next 30 years	6.25	1.27	7.00	6-7
Q28.1 The ecological crisis real	6.58	1.07	7.00	7-7
Q28.2 The ecological crisis is related to human activity	6.58	1.05	7.00	7-7
Q28.3 The ecological crisis will present significant threats to people in Leicestershire within the next 30 years	6.17	1.34	7.00	6-7

*Note: N = 1028. Min = 1, Max = 7. *An interaction between age and gender was found. Aa main effect of age was found. Ga main effect of gender was found.*

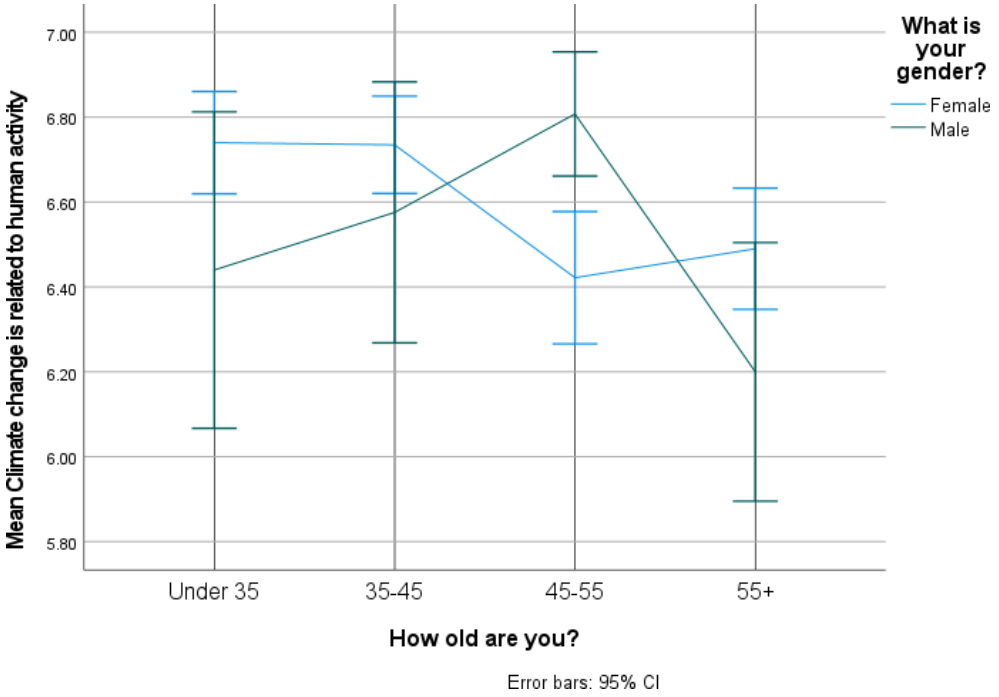

FIGURE 4: INTERACTION BETWEEN AGE AND GENDER ON Q27.2

Responses to Q31.2 ("The chance to tackle the climate/ecological crisis has passed and it is too late to make a real difference now") was significantly, positively correlated with total and subscale CCAS scores (Table 2). Participants who reported the highest levels of climate anxiety believed more strongly that it is too late to make a difference to the climate change crisis, than those who reported lower levels of climate anxiety. It should be noted that although the correlations are significant, they are weak.

3.3 Expectations of self and others

Two variables were created from questions taken from Q31, 32, and 33. The first variable is labelled "People should", and the second is labelled "Others should". These variables explore who the participants believe should engage in climate actions and which actions they believe would help to reduce climate change. Descriptive statistics are presented in Table 5 below.

TABLE 5: DESCRIPTIVE STATISTICS OF EXPECTATIONS OF "PEOPLE SHOULD" AND "OTHERS SHOULD" VARIABLES

Variable	*M*	*SD*	*Min*	*Max*	*Skewness*	*Kurtosis*
"Others should"	5.02	.70	1	6.67	-1.16	2.77
"People should"	5.56	.95	1	7	-1.15	1.16

A significant interaction between age and gender variables was found for the "People should" variable ($F(3,1005) = 5.33$, $p = .001$; $\eta_p^2 = .016$). Additionally, a simple main effect was found for gender ($p = .048$; $\eta_p^2 = .004$). On average, females ($M = 5.60$, $SD = 0.912$) scored higher than males ($M = 5.40$, $SD = 1.09$) on this variable, however, this varied depending on the age of the participant as reflected in the significant interaction effect found. Figure 4 presents this interaction pattern and shows that the youngest and oldest

male participants scored the lowest on this variable but scored slightly higher than females in the 45-54 years age category.

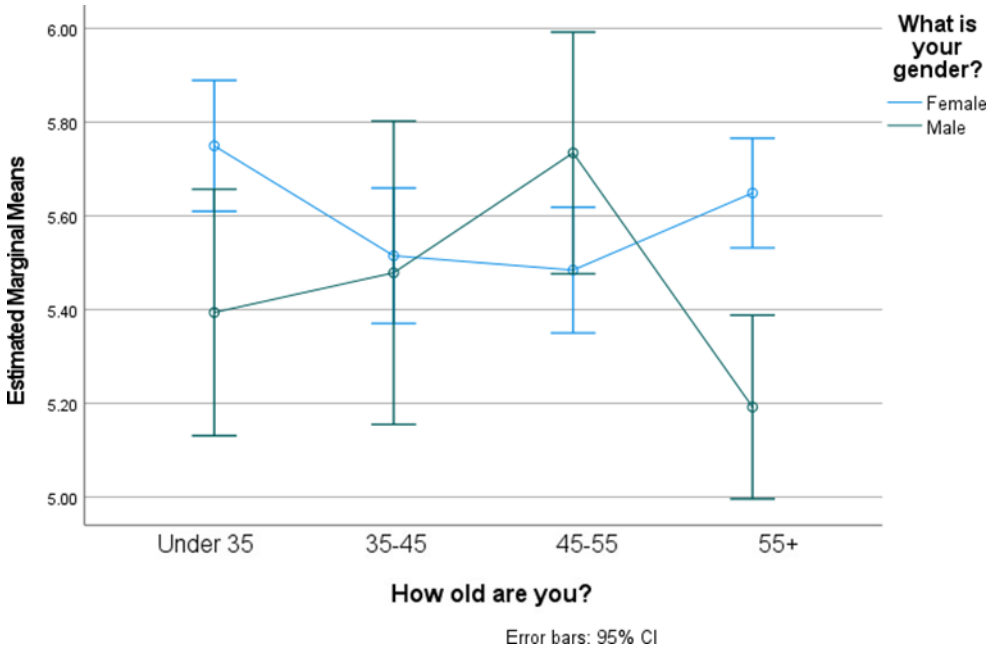

FIGURE 5: INTERACTION PLOT SHOWING INTERACTION BETWEEN AGE AND GENDER ON "PEOPLE SHOULD" VARIABLE

No interaction between age and gender was found for the "Others should" variable scores (F(3,1005) = 2.02, p = .209; ηp^2 = .006). A simple main effect of age was found for responses on the "Others should" variable (F(3,1005) = 5.102, p = 0.02; ηp^2 = .015). Post-hoc analyses revealed significantly higher mean scores reported by those in the Under 35 age group (M = 5.18, SD = 0.69) compared to the 45-44 age group (M = 4.94, SD = 0.71) and the Over 55 age group (M = 4.95, SD = 0.73).

3.3.1 Climate anxiety and participants' expectations of self and others

Both variables were significantly and positively correlated with the CCAS total and subscale scores (see Table 2). Interestingly, significant negative correlations were found between Q31.2, "The chance to tackle the climate/ecological crisis has passed and it is too late to make a real difference now", and beliefs about the reality of climate change (Q27.1) (r = -.076) and agreement with the threat of climate change on Leicestershire (Q27.3) (r = -.078). This suggests participants who more strongly agreed with the latter variables also believed more strongly that the chance to reduce climate change had passed.

An analysis of variable Q33.1, "Recycling is important to combat climate change", was completed as the act of recycling is entrenched into UK society and culture as a climate-positive action which can reduce waste and greenhouse gas emissions (M = 6.24, SD = 1.15). The present project found responses to this variable were not significantly correlated with CCAS total or subscale scores (see Table 2). But an association between greater expectations of self, others and recycling was suggested as a significant, positive correlation was found between Q33.1 and both the "Others should" (r = .110) and "People should" variables (r = .188).

3.4 Attitudes towards re-wilding

Participants were asked to report how many of the 11 listed pro-nature features they had in their garden (Q17). The mean number was 6.84 (SD = 2.69). More females than males reported having

higher numbers of these features. No correlational relationship was found between reported climate anxiety (CCAS scores) and the number of pro-nature features a person reported having in their garden.

3.4.1 Garden preferences

Participants were also asked how they would prefer their garden to be (Q21), by rating each of the seven items from one (not at all like that) to seven (completely like that). The highest-rated item was "secure and private" and the lowest was "overgrown and messy". See Figure 6 for details of each item and ratings.

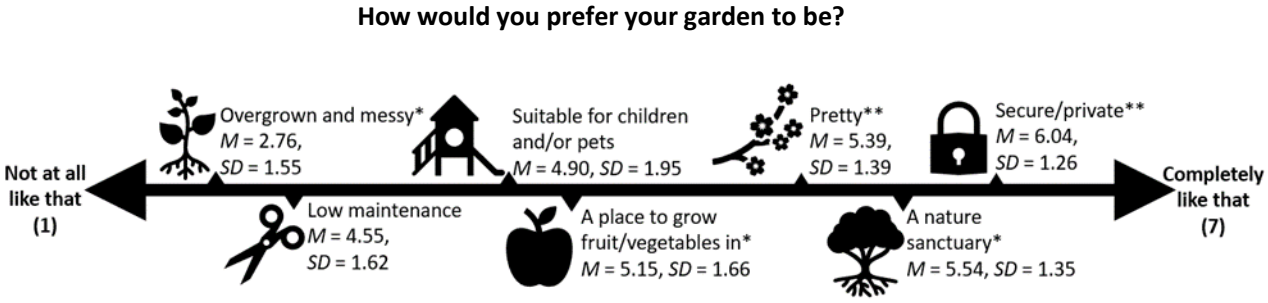

FIGURE 6: AVERAGE MEAN SCORE AND STANDARD DEVIATION FOR RESPONSES TO SEVEN ITEMS ON GARDEN PREFERENCES, WHICH ASKED PARTICIPANTS HOW THEY WOULD LIKE THEIR GARDEN TO BE.

**Significantly, positively correlated with CCAS scores, **significantly, negatively correlated with CCAS scores.*

A two-way ANOVA, with mean total CCAS score and age as independent variables, was conducted for each of the items included in Q21, to examine the effects of climate anxiety and age on garden preferences. No interaction effects were found for any of the items however simple main effects analyses revealed age had a significant effect on scores for the following items: "suitable for children or pets" ($p < .001$), "low maintenance" ($p < .001$), "pretty" ($p = .005$), "a place to grow fruit and vegetables in" ($p = .010$), "secure and private" ($p < .001$), and "overgrown and messy" ($p = .013$). CCAS scores had a significant main effect on the following items: "pretty" ($p = .045$), "a place to grow fruit and vegetables in" ($p = .003$), "a nature sanctuary" ($p = .003$), "secure/private" ($p = .059$), and "overgrown and messy" ($p < .001$). Correlational analyses were completed to investigate these main effects. Significant positive correlations were found between CCAS scores and "a place to grow fruit and vegetables in" ($r = .225$, $p < .001$), "a nature sanctuary" ($r = .231$, $p < .001$), "overgrown and messy" ($r = .290$, $p < .001$). This suggests the more climate anxious a participant was, the more they preferred to have these features in their garden. Significant, negative correlations were found between CCAS scores and "pretty" ($r = -.068$, $p = .031$), "secure and private" ($r = -.128$, $p < .001$), suggesting the more climate anxious a participant was, the less they preferred to have 'pretty' or 'secure/private' gardens.

3.4.2 Barriers to re-wilding private gardens

Q22 required participants to report how much of a barrier twelve garden elements were to re-wilding their own garden (one = not a barrier, to seven = a huge barrier), see Table 9 for descriptive statistics. The mean score of the sum of all twelve barriers was 2.83 ($SD = 1.03$). This is close to the 'not a barrier' end of the rating scale. The largest barriers (highest mean scores) reported were "cost of alterations", "lack of time", and "wanting to keep a paved driveway". The lowest mean scores were "disagreements with others", and "ensuring access to the garden for people with limited mobility". Correlational analyses revealed several significant positive and negative correlations with CCAS scores (Table 6).

TABLE 6: DESCRIPTIVE STATISTICS FOR BARRIERS TO RE-WILDING AND CORRELATION WITH MEAN CCAS SCORES

	Item	Mean	SD	r	p
A huge barrier (7)	Lack of time to make changes	3.5	1.99	.064*	0.046
	Worries about the security of the garden (e.g., if fences were to be replaced with hedges)	3.46	2.27	-.108**	< .001
	Wanting to keep a paved driveway	3.45	2.38	-.071*	0.025
	Cost of alteration	3.43	2.07	.117**	< .001
	I don't know how to re-wild my garden	3.04	1.98	0.057	0.073
	Worries about the value of property going down if the garden looks wild	2.92	2	-.100**	0.002
	Needing a space for play	2.68	2.03	0.019	0.542
	Worries about what neighbours or visitors would think if they saw "overgrown" plants, grass, or weeds	2.67	1.96	0	0.996
	Artificial grass or paved area is easier to maintain	2.46	2.06	-0.052	0.101
	Allergies such as hay fever	2.45	1.96	-0.022	0.489
	Disagreements with others about rewilding (e.g., people I live with or landlords)	2	1.87	.156**	<.001
Not a barrier (1)	Ensuring access and use of the garden to people with limited mobility	1.83	1.52	0.67*	0.034

*** correlation is significant at the 0.01 level. * Correlation is significant at the 0.05 level.*

3.4.3 Would the participant like more pro-nature features in public spaces?

Participants rated whether they would like to see more of 13 re-wilding related features in local public spaces from one (I would really not like this) to seven (I would really like this). The 13 features were collated by the researchers to make up Q25, with a Cronbach's Alpha score of .878. The average total score for all 13 items was 6.14 (*SD* = .841), which falls in the "I would like this" response category. The mean score for Q25 was significantly positively correlated with mean CCAS scores, although with a small effect size, r = .249, p < .001.

4. Discussion

The present study aimed to explore how anxious the Leicestershire (UK) population were about climate change and how this interacted with their attitudes and beliefs around climate actions. The climate actions investigated were particularly focused on the re-wilding of private and public spaces, and the expectations of the public and those with power in society. A large number of individuals completed the questionnaire (N = 1028). The analysis of the questionnaire data centred around participants' self-reported scores on the Climate Change Anxiety Scale (Clayton & Karazsia, 2020b); the relationship of scores on this measure with several other variables were assessed. A particular focus was placed on the influence of age and gender on climate anxiety and attitudes toward climate actions as previous research has found differences such as higher anxiety in young adults compared to older adults (Hornsey et al., 2016) and higher anxiety in females compared to males (Heeren et al., 2021). As per the nature of exploratory research, the outcomes of this investigation into a large data set with many variables and interactions provide scope for future exploration and research.

It is recognised by the researcher that climate anxiety as a negative, unwanted psychological experience is not without critique. For instance, in a recent review of climate-related anxiety and worry, Ojala and colleagues (2021) propose the potentially constructive role of climate-related worry, in that it may

motivate individuals to engage in climate actions. Yet, the term anxiety and the style of questions used in the CCAS may be perceived as negative and perhaps induce a social-desirability bias in the participants, i.e., participants may report levels of anxiety than they truly experience (van de Mortel & Thea, 2008). Even so, correlations were found in this study that suggested those with higher CCAS scores (higher anxiety) found re-wilding garden features more preferable than those with lower CCAS scores. Additionally, those who scored higher on the CCAS also believed more strongly that both the public and those with more societal power should do more to reduce climate change. These findings are expanded upon below and to conclude, the potential clinical implications of this research are considered.

4.1 How anxious is this population about climate change?

First, it is important to note that, on average, participants believed that climate change is a true phenomenon. On average, participants responded with strong agreement that climate change is real (*M* = 6.64, *SD* = 1.04) and males and females reported similar scores. Participants in the Over 55 age categories reported significantly less agreement with this statement than the younger age groups, although the Over 55 average response was in the 'strong agreement' range. Even so, this result is in line with previous research that suggests older people are slightly less likely to believe in climate change (Hornsey et al., 2016). Responses to this item were significantly, and positively correlated with scores on the CCAS, suggesting that the stronger the agreement with the reality of climate change, the more anxious about climate change the participants reported themselves to be. This correlational relationship between climate change awareness and worry is supported by previous research (Mouguiama-Daouda et al., 2021). The Cognitive-Emotional Impairment subscale mean score was slightly higher than the Functional Impairment subscale score for the whole population, suggesting worries about climate change may have less of an impact on daily functioning than on a person's psychological well-being.

The local population examined here seemed to be less anxious about climate anxiety compared to other populations, (such as populations from Australia and New Zealand, Feather & Williams, 2022; Phillipines, Reyes et al., 2021; Germany, Wullenkord et al., 2021). However, average responses were in the "never" to "rarely" range for all CCAS items, in the present research and the comparison studies. The reasons why the Leicestershire population may be, on average, feeling slightly though significantly less psychologically affected by climate crisis concerns than populations from other countries can only be speculated here. For instance, the average CCAS score, from the Filipino population study, was the highest of the comparison studies (Reyes et a., 2021). This may be related to the proximity of participants to immediate climate crisis threats. Leicestershire, a land-locked area of England, is not deemed to be at risk of immediate, visible, damaging climate threats such as extreme weather events. However, the Philippines was rated as the country most at risk from the climate crisis due to exposure to extreme weather events and rising sea levels, as reported in the 2019 Global Peace Index Report.

Females scored significantly higher on the CCAS than males, a finding that is supported by existing research (Heeren et al., 2021). However, an interaction was found between age and gender on CCAS scores ($F(3,1005) = 3.54$, $p = 0.14$; $\eta p^2 = .010$) which revealed the youngest females reported the highest level of climate anxiety and the oldest males reported having the lowest levels.

4.1.1 Comparisons with other populations

Comparisons with all known CCAS validation studies at the time of analysis in populations of various nationalities revealed the local population to be the least anxious about climate change (Feather & Williams, 2022; Reyes et al., 2021; Wullenkord et al., 2021). The largest mean CCAS score reported among

these papers was in a population of Generation Z young people (aged 18 to 26) from the Phil- lipines (M = 2.38, SD = 7.7) (Reyes et al., 2021). It is unsurprising that the local population, with a wide range of ages, reported lower levels of climate anxiety than the Generation Z population. However, it remains unclear why the local population scored significantly lower on the CCAS than the German population (mean age = 43.91) (Wullenkord et al., 2021) or the population from Australia and New Zealand (mean age = 33) (Feather & Williams, 2022). Perhaps a further understanding of the climate change-related exposure each of these populations has through local media and political discourse could provide an understanding of these differences (I Valentin et al., 2021).

4.2 What expectations of themselves and others do this population have in relation to climate actions?

Participants, on average, agreed strongly that climate change is related to human activity and that it will pose a threat to their lives within the next 30 years. Interestingly, males in the 45-55 age group reported the strongest agreement with this statement, while males in the Over 55 group reported the lowest levels of agreement (yet the average score remained in the agreement response category). Individuals in the younger age groups believed humans were responsible for contributing to changes in climate temperatures more than the older members of this population. This project explored these beliefs further by asking participants to consider a series of "should" statements about 'people', being themselves and other members of the public (e.g., people should walk or cycle instead of using a car when they can), and about 'others' with more financial or political power (e.g., industries should be punished if they are too harmful to the environment).

Participants' scores on the two variables suggest higher expectations of what the public could do ("People should" variable) to tackle climate change than the wealthiest of society and industries ("Others should" variable). A significant interaction effect was found between age and gender on the "People should" variable. Interestingly, Figure 5 shows this interaction pattern is similar to that found in the interaction between age and gender on the CCAS score. That is, the youngest females scored the highest and the oldest males scored the lowest. This suggests females in the Under 35 age group reported greater agreement that themselves and the public should take climate-positive actions, than the youngest and oldest groups of males. Another finding to highlight here is that again males in the 45-55 category scored higher than males in other groups. No interactions between age and gender were revealed for the "Others should" variable but a simple main effect of age was found. Here, individuals in the Under 35 age group reported significantly less agreement with statements suggesting "others" should take responsibility for tackling the climate crisis, than participants in the 45-55 and Over 55 age groups.

4.2.1 Climate anxiety and expectations of self and others

Both "People should" and "Others should" variables were significantly, and positively correlated with the mean CCAS score (and subscales). Therefore, the higher levels of climate anxiety reported, the more strongly the participants agreed that they, people in general, the rich, companies, and those in power should do more to reduce climate change. This finding is in line with previous research that found higher climate anxiety rates to be correlated with pro-environmental intentions (Wullen- kord et al., 2021).

4.3 What beliefs and attitudes do this population have towards re-wilding?

Research has found that exposure to the impact of climate change is not enough to change behaviour; in fact, individual values must be considered if pro-environmental, climate actions are to be encouraged (Kapeller & Jäger, 2020). The data collected here provides an insight into the values the local population

have around their private and public green spaces. For instance, out of seven proposed garden features, participants would prefer their garden to be secure and private, and would least prefer their garden to be overgrown and messy. The latter describes the perceived aesthetic of a wild garden as natural grass and native flowers are recommended (Webb & Moxon, 2021). Yet, it can be argued the adjectives "overgrown" and "messy" have negative connotations the participant may not want to associate themselves with. That is, they may dislike the idea of having an unseemly garden, which may by extension, express something negative or socially embarrassing about the garden owner themselves. Perhaps as being unable or incapable of tending to their garden. Therefore, the use of "overgrown" and "messy" in conjunction may have biased the participants to report less preference for what could be better described as a re-wilded garden. The item could have been better described in a more neutral way, such as "overgrown" and "natural", which may have resulted in a more balanced or preferable response. This is further supported by the finding that the second highest preference was for the garden to be "a nature sanctuary", suggesting participants would like their private species to be a pro-nature environment. Correlational analyses found those with higher climate anxiety scores reported higher preferences for the following items: a place to grow fruit and vegetables, a nature sanctuary, and overgrown and messy. Higher climate anxiety scores were correlated with less preference for a pretty or secure and safe garden. These results may imply participants with greater climate crisis-related worries held more positive attitudes towards the re-wilding of their gardens. Similarly, participants with higher anxiety scores were more in favour of re-wilding public spaces than those with lower climate anxiety scores ($r = .249$, $p < .001$).

4.4 Limitations and future directions

This study did not compare climate anxiety with other mental health-related experiences. Therefore, it is unclear if higher climate anxiety scores were associated with related with other measures of psychological well-being as has been found in some research (Coffey et al., 2021; Reyes et al., 2021). Should the present research be replicated, questions should be included that invite the participants to divulge their understanding of the climate change crisis compared to the ecological crisis. This would improve the current project as interaction effects between age and gender were found in response to questions relating to the reality and impact of climate change, but not for similar questions about the ecological crisis. The reasons behind these differences are unclear. Yet public discourse (media, news etc.) at the time of writing this research uses the term 'climate crisis' much more frequently than 'ecological crisis. Perhaps the participants were less familiar with the term 'ecological crisis. Finally, item eight of the CCAS was omitted during the development of the questionnaire. This reduced the total number of CCAS items from 13 to 12. While analysis of the internal reliability of the 12 items was favourable, the comparisons made between CCAS scores in the present study and pre-existing research (that used the full 13-item CCAS) cannot be entirely reliable and valid comparisons. On a similar note, there was a vast amount of data collected via the questionnaire used in this research, made up of data from both pre-existing standardised questionnaires and novel question sets (created by the researchers). This may allow for validation of the novel subsets of questions, particularly those that attempt to measure pro-nature preferences and attitudes (e.g., how a person would prefer their garden to be). However, due to time constraints the researcher was unable to attempt this.

The Theory of Planned Behaviour (TPB) proposes behaviours stem from intentions and perceived behavioural control and that the intention to engage in the behaviour is based on beliefs held by an individual (Azjen , 1991). The TPB has been applied to the study of the factors underlying pro-environmental behaviour (Yuriev et al., 2020). However, the TPB was not included in the development of this research. Upon reflection, the TPB could have been used as a lens through which to examine

participants' pro-nature attitudes and associations between this and engagement with pro-nature behaviour. As the title of this research states, this project focused on attitudes towards pro-nature and rewilding actions. Moving forwards, the TPB could be helpfully implemented as a tool to inform further investigations of the pro-nature/re-wilding/climate action behaviour of participants, in addition to their intentions and actions. Particularly if new research collects specific data on intentional active engagement in such behaviours, which the present study did not.

Additionally, research that has applied the Health Belief Model to the understanding of engagement in pro-environmental behaviour has highlighted the role the media plays in beliefs about the threats climate crisis poses (Iftikhar & Yousaf, 2021). This present research however did not capture media exposure to climate-crisis-related information, but it may be inferred that the Leicestershire population were less exposed to warnings about the impact of the climate crisis than people located in countries more at risk of direct harm, such as the Philippines. Perhaps media exposure and climate-crisis narratives may influence the behaviour and attitudes of the participants.

4.5 Clinical implications

An important, growing area of inquiry explores what the emotional responses to climate change are and whether these emotional responses are a constructive, motivating force that leads to climate action (Ojala et al., 2021). The data collected here provide insight into the values the local population have around their private green spaces and their expectations of themselves, the public and those with power in society.

This paper found the local population reported experiencing low levels of climate anxiety, but there were significant, positive correlations between higher CCAS scores and stronger agreement that pro-environmental climate actions should be taken. Furthermore, this paper revealed largely positive attitudes towards re-wilding of both private and public spaces, which could be shared with local authorities interested in re-wilding public urban and green spaces (Kapeller & Jäger, 2020). The participants generally favoured pro-nature garden features but barriers such as the cost of re-wilding, a lack of time to make changes, and a desire to keep a paved driveway were present. Consideration of these barriers is important as according to the HBM a person's perceived ability to successfully engage in pro-environment behaviour, or their self-efficacy is a predictive factor in whether they engage in these behaviours or not (Kim & Cooke, 2021). This research highlights the beneficial role psychologists can hold in the design of local or government schemes aimed at encouraging the public to engage in climate actions.

The youngest group of female participants reported the highest level of climate anxiety and agreed the most strongly that individual people like themselves should engage in climate actions. This is in line with other research into the impact of the climate crisis on mental health; that the youngest members of society are the most concerned and most anxious about the climate crisis (Hickman et al., 2021). The current project suggests this group may also feel the most responsibility to enact change to reduce climate change. This should be considered by mental health professionals, particularly those working with this group of people who may be experiencing an understandable but nevertheless distressing anxiety response to the climate crisis. To be better informed mental health practitioners of the climate crisis, and its effects on psychological health, may encourage clinicians to feel more confident in offering support for the wider societal and environmental factors that can impact a person's well-being. It may also allow the clinician to better understand the shared trauma experienced by large groups of the global population, which in turn could empower them to feel able and motivated to use their compassionate, clinical skills to support their local community to engage in climate-crisis conversation and action.

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Appendices

Appendix A: Guidelines to authors for the journal targeted for literature review

The target journal, Cognitive Psychology, guidelines can be found at:

https://www.elsevier.com/journals/cognitive-psychology/0010-0285/guide-for-authors

Appendix B: Checklist to ensure the anonymity of participants

This checklist was taken from the coursework handbook.

	Checked in Abstract	Checked in main text	Checked in Appendices
Pseudonym or false initials used	X	X	X
Reference to pseudonym/false initials as a footnote	X	X	X
Removed any reference to names of Trusts/hospitals/clinics/services (including letterhead if including letters in appendices)	X	X	X
Removed any reference to names/specific dates of birth/specific date of clinical appointments/addresses/ location of client(s), participant(s), relatives, caregivers, and supervisor(s). [For research thesis – supervisors can be named in the research thesis "acknowledgements" section]	X	X	X
Removed/altered references to client(s) jobs/professions/nationality where this may potentially identify them. [For research thesis – removed potential for an individual research participant to be identifiable (e.g., by a colleague of the participant who might read the thesis on the internet and be able to identify a participant using a combination of the participants specific job title, role, age, and gender)]	X	X	X
Removed any information that may identify the trainee (consult with course staff if this will detract from the points the trainee is making)	X	X	X
No Tippex or other method has been used to obliterate the original text – unless the paper is subsequently photocopied and the trainee has ensured that the obliterated text cannot be read	X	X	X
The "find and replace" function in word processing has been used to check the assignment for use of client(s) names/other confidential information	X	X	X

Appendix C: Data extraction tool

The following details were extracted into a database for the eleven papers reviewed.

- Author
- Title
- Year published
- Journal
- Reference
- Completed quality appraisal?
- Aims
- Hypothesis
- Sample Age
- Sex
- Payment
- Joint action task used
- How were participants encouraged to participate in the task?
- Performance measurements used
- Were reaction times recorded?
- Were error rates recorded?
- Relationship between participants?
- Emotional experience
- Self-report measures of emotional experience
- Physiological measures
- Task performance feedback
- Did participants evaluate their performance?
- Results: Reaction times
- Results: Error rates
- Results: other joint task outcomes
- Author/s' interpretation of results
- Comments

Appendix D: Quality appraisal tool

Quality assessment tool for quantitative studies, taken from Thomas et al., 2004.

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

1 Very likely
2 Somewhat likely
3 Not likely
4 Can't tell

(Q2) What percentage of selected individuals agreed to participate?

1 80 - 100% agreement
2 60 – 79% agreement
3 less than 60% agreement
4 Not applicable
5 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

1 Randomized controlled trial
2 Controlled clinical trial
3 Cohort analytic (two group pre + post)
4 Case-control
5 Cohort (one group pre + post (before and after))
6 Interrupted time series
7 Other specify _____
8 Can't tell

Was the study described as randomized? If NO, go to Component C.

No Yes

If Yes, was the method of randomization described? (See dictionary)

No Yes

If Yes, was the method appropriate? (See dictionary)

No Yes

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) CONFOUNDERS

(Q1) Were there important differences between groups prior to the intervention?

1 Yes
2 No
3 Can't tell

The following are examples of confounders:

1 Race
2 Sex
3 Marital status/family
4 Age
5 SES (income or class)
6 Education
7 Health status
8 Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

1 80 – 100% (most)
2 60 – 79% (some)
3 Less than 60% (few or none)
4 Can't Tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

D) BLINDING

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

1 Yes
2 No
3 Can't tell

(Q2) Were the study participants aware of the research question?

1 Yes
2 No
3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?

1 Yes
2 No
3 Can't tell

(Q2) Were data collection tools shown to be reliable?

1 Yes
2 No
3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

1 80 -100%
2 60 - 79%
3 less than 60%
4 Can't tell

(Q2) Was the consistency of the intervention measured?

1 Yes
2 No
3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

4 Yes
5 No
6 Can't tell

H) ANALYSES

(Q1) Indicate the unit of allocation (circle one)

community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one)

community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

1 Yes
2 No
3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

1 Yes
2 No
3 Can't tell

GLOBAL RATING

COMPONENT RATINGS

Please transcribe the information from the gray boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	**SELECTION BIAS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
B	**STUDY DESIGN**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
C	**CONFOUNDERS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
D	**BLINDING**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
E	**DATA COLLECTION METHOD**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	
F	**WITHDRAWALS AND DROPOUTS**	**STRONG**	**MODERATE**	**WEAK**	
		1	2	3	Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

1	STRONG	(no WEAK ratings)
2	MODERATE	(one WEAK rating)
3	WEAK	(two or more WEAK ratings)

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

1	Oversight
2	Differences in interpretation of criteria
3	Differences in interpretation of study

Final decision of both reviewers (circle one):

1	**STRONG**
2	**MODERATE**
3	**WEAK**

Appendix E: Guidelines to authors for the empirical report targeted journal

The target journal, The Journal of Environmental Psychology, guidelines can be found at:

Guide for authors - Journal of Environmental Psychology - ISSN 0272-4944 (elsevier.com)

Appendix F: Letter from Ethics Committee

UNIVERSITY OF LEICESTER

School of Psychology Research Ethics Committee

02/06/2020

Ethics Reference: [redacted]

TO:
Name of Researcher Applicant: [redacted]
Department: Psychology
Research Project Title: Attitudes and actions associated with re-wilding Leicestershire: An initial survey for the Mutualistic Cities project.

Dear [redacted],

RE: Ethics review of Research Study application

The School of Psychology Research Ethics Committee has reviewed and discussed the above application.

1. Ethical opinion

The Committee grants ethical approval to the above research project on the basis described in the application form and supporting documentation, subject to the conditions specified below.

2. Summary of ethics review discussion

The Committee noted the following issues:
The proposed amendments do not pose additional ethics issues.

3. General conditions of the ethical approval

The ethics approval is subject to the following general conditions being met prior to the start of the project:

As the Principal Investigator, you are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Research Code of Conduct and the University's Research Ethics Policy.

If relevant, management permission or approval (gate keeper role) must be obtained from host organisation prior to the start of the study at the site concerned.

4. Reporting requirements after ethical approval

You are expected to notify the Committee about:

- Significant amendments to the project
- Serious breaches of the protocol
- Annual progress reports
- Notifying the end of the study

5. Use of application information

Details from your ethics application will be stored on the University Ethics Online System. With your permission, the Committee may wish to use parts of the application in an anonymised format for training or sharing best practice. Please let me know if you do not want the application details to be used in this manner.

Best wishes for the success of this research project.

Yours sincerely,

[redacted]
Chair

Appendix G: Epistemology of research

The researcher took a positivist approach in both the literature review and the empirical research project. For the literature review there was an assumption that there is a true experience of emotions that can be measured using self-report questionnaires. A positivist approach lends itself well to the quantitative nature of the empirical report and the assumption that climate anxiety and related beliefs can be observed as true phenomena.

Appendix H: Bar chart showing left-skewed distribution of mean total CCAS scores

FIGURE 1: BAR CHART SHOWING LEFT-SKEWED DISTRIBUTION OF MEAN TOTAL CCAS SCORES

Appendix I: Chronology of research process

Stage of research	***Timescale***
Discussions of research topic with university supervisor	June 2019
Development of the research proposal and finalise research question	June to Sept 2019
Finalise research design, methodology and measures. Submit for peer review. **Collect key references and consider literature review question.**	August 2019 – Feb 2020
Amendment to research proposal and development of research design. Develop a new experiment to be run online due to Covid-19 social restriction guidance.	March – June 2020
Researcher took maternity leave	June 2020 – July 2021
Review of empirical project and work on literature review. **Empirical project data set was collected, and exploratory analysis was completed.**	July 2021 – Dec 2021
Write up of final draft of the literature review and empirical project. Submission of the thesis.	Jan 2022 – June 2022
Projected plans	
Preparation for research viva **Preparation of empirical report for publication**	June 2022 – September 2022
Submission of empirical report for publication	September 2022
***Amendments were made to the thesis and submitted to the University in November 2022**	