Journal Pre-proof

Examining two of the ingredients of Cognitive Therapy for adolescent social anxiety disorder: Back-translation from a treatment trial.

Eleanor Leigh, David Clark, Kenny Chiu

Please cite this article as: Leigh, E., Clark, D., Chiu, K., Examining two of the ingredients of Cognitive Therapy for adolescent social anxiety disorder: Back-translation from a treatment trial., *Journal of Behavior Therapy and Experimental Psychiatry*, https://doi.org/10.1016/j.jbtep.2025.102020.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Title: Examining two of the ingredients of Cognitive Therapy for adolescent social anxiety disorder: Back-translation from a treatment trial.

Authors and Affiliations:

Eleanor Leigh

Department of Experimental Psychology, University of Oxford, Oxford, UK

ORCID 0000-0003-2756-3770

David Clark

Department of Experimental Psychology, University of Oxford, Oxford, UK

ORCID 0000-0003-2756-3770

Kenny Chiu

Department of Clinical Psychology and Psychological Therapies, University of East

Anglia, Norwich, UK

ORCID 0000-0001-08776-9864

Correspondence author:

Eleanor Leigh, eleanor.leigh@psy.ox.ac.uk

Declaration of interests:

The authors do not have any potential competing interests related to this work.

Author Contributions:

Eleanor Leigh: Conceptualization; Funding acquisition; Investigation; Methodology; Project

administration; Supervision; Writing - original draft; Writing - review & editing

David Clark: Conceptualization; Funding acquisition; Writing – review & editing

Kenny Chiu: Methodology; Data curation; Formal analysis; Writing - original draft; Writing - review & editing

Abstract

Background: Cognitive Therapy for Social Anxiety Disorder (CT-SAD) based on the Clark & Wells model is a complex intervention comprised of a series of therapeutic elements. Two of the key ingredients are the *self-focused attention and safety behaviour experiment* and *video feedback*. The present study examined the effects of these two therapeutic procedures in adolescents with SAD, as well as common themes of the young people's social fears and negative self-images. **Method:** 35 participants with a diagnosis of SAD completed internet-delivered CT-SAD as part of a randomised controlled trial. We conducted a series of paired samples t-tests to evaluate the effects of the *self-focused attention and safety behaviour experiment* and *video feedback*. We applied Latent Dirichlet Allocation to identify latent topics based on participants' description of their social fears and negative self-images that were elicited during the course of these therapy procedures. **Results:** Participants reported lower anxiety and more positive self-appraisals when focusing externally and dropping safety behaviours, compared to when focusing internally and using safety behaviours ($ps < .0025$). After they watched the videos compared to before, they reported more positive appraisals of their appearance and performance ($ps < .0025$). The differences in these outcomes were significantly larger when they focused internally and used safety behaviours, compared to focusing externally and dropping safety behaviours ($ps < .0025$). Topic modelling identified six social fear topics and five negative self-image topics. **Conclusions:** Self-focused attention, safety behaviours, and negative self-imagery are modifiable with the 'self-focused attention and safety behaviour experiment' and 'video feedback' as part of internet delivered CT-SAD.

Keywords: Cognitive Therapy, CBT, Social Anxiety, Adolescent, Safety Behaviours, Self-focused Attention, Imagery

1   **Title:** Examining two of the ingredients of Cognitive Therapy for adolescent social anxiety

2   disorder: Back-translation from a treatment trial.

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25 **Introduction**

26 Social Anxiety Disorder (SAD) is a highly prevalent (Kessler et al., 2005) and persistent

27 condition (Bruce et al., 2005) that mostly first occurs before adulthood (Solmi et al., 2022). It

28 often causes substantial impairment, affecting academic attainment (Vilaplana-Pérez et al.,

29 2021), peer relationships (Chiu et al., 2021), and the risk of further anxiety disorders,

30 depression, and suicidal thoughts (Chiu et al., 2024). Timely effective intervention for SAD in

31 young people[1] therefore has the potential to deliver considerable benefits.

32

33 Great strides have been made in the treatment of adult SAD with the development of

34 psychological therapies designed to reverse cognitive and behavioural mechanisms that are

35 implicated in its persistence. One such treatment that has been shown to outperform a

36 number of credible alternatives is Cognitive Therapy for SAD (CT-SAD; Mayo-Wilson et al.,

37 2014), which is based on the Clark and Wells' (Clark & Wells, 1995) model of social anxiety.

38 The model seeks to explain the persistence of social anxiety. It suggests socially anxious

39 individuals engage in heightened self-focus in social and performance situations, reducing

40 the opportunity to gather feedback from their environment which may counter negative

41 perceptions. Furthermore, when internally focused, individuals attend to symptoms of

42 anxiety as well as excessively negative and distorted images of themselves and how they

43 come across. To prevent or mitigate their social fears, socially anxious individuals engage in a

44 range of safety behaviours, such as avoiding eye contact and rehearsing sentences. However,

45 these safety behaviours inadvertently reduce the individual's opportunity to disconfirm their

46 negative beliefs.

---

[1] Young people and adolescents are used interchangeably here, to refer to young people aged 11 to 18 years.

47

48 CT-SAD comprises a series of treatment elements designed to reverse the processes outlined

49 in the model. Initially, the therapist and patient develop a personalized model of the

50 processes involved in maintaining an individual's social anxiety. The therapist then guides

51 the patient through an experiential exercise to test the adverse effects of self-focused

52 attention and safety behaviours (hereon called the 'self-focused attention and safety

53 behaviour experiment'). This involves the patient participating in a challenging social

54 interaction task, once whilst using self-focus and safety behaviours and then again whilst

55 focusing externally and reducing safety behaviours. Ratings of anxiety, self-consciousness,

56 and appraisals of performance are compared between the two interactions to help the

57 patient learn about the unintended negative effects of self-focus and safety behaviours.

58 Subsequently, video recordings of the interactions undertaken as part of the 'self-focused

59 attention and safety behaviour experiment' are reviewed to help patients correct excessively

60 negative images of their social performance (hereon referred to as 'video feedback'). In CT-

61 SAD, video feedback is conducted after careful verbal preparation to help reduce processing

62 biases that can interfere with the patient objectively viewing themselves on screen (see

63 Warnock-Parkes et al. (2017) for a full description of video feedback). Following video

64 feedback, patients receive training in externally focused attention, and then the focus of

65 therapy shifts to behavioural experiments that help patients test and disconfirm their fearful

66 beliefs about social interactions (see www.oxcadatresources.com for a full description of CT-

67 SAD procedures).

68

69 Empirical evidence for the role of the processes specified in the model (self-focused

70 attention, negative self-imagery, and safety behaviours) in social anxiety in adults has come

71 from laboratory studies and from studies examining treatment components in CT-SAD (for

72 reviews, see: Ng et al., 2014; Norton & Abbott, 2017; Piccirillo et al., 2016). For example, in

73 relation to self-focused attention and safety behaviours, an experimental study with a

74 community sample showed that manipulating these two processes during an interaction

75 task modulated anxiety and self-perceptions of performance (McManus et al., 2008).

76 Consistent with this, a study examining the effect of the 'self-focused attention and safety

77 behaviour experiment' conducted in one session as part of a full course of CT-SAD was found

78 to improve patient-reported state anxiety and appraisals of performance (McManus et al.,

79 2009). Similar findings have been reported in relation to negative imagery. Experimental

80 laboratory studies have found that reducing negative mental imagery during a social

81 interaction task via instructions (Hirsch et al., 2003) and via video feedback (Hirsch et al.,

82 2004) is associated with lower anxiety and improved social performance. This finding was

83 replicated when the effects of 'video feedback' on state anxiety and self-reported

84 performance completed in a single session of CT-SAD were examined (McManus et al.,

85 2009). Additionally, a recent study by Wild et al. (2023) demonstrated that 'video feedback'

86 reduced patients' social anxiety and improved self-perceptions in both face-to-face and

87 internet-delivered formats as part of a randomised control trial.

88

89 With the aim of improving treatment outcomes for young people with SAD (Evans et al.,

90 2021; Skumsnes et al., 2024), there has been increasing interest in whether the processes

91 outlined in the Clark and Wells (1995) model are also relevant to the persistence of

92 adolescent social anxiety, and also in whether CT-SAD may be helpful for this population.

93 Findings from adults cannot be assumed to be relevant to adolescents due to the ongoing

94   maturation of relevant underlying social-cognitive processes such as perspective-taking, self-

95   consciousness during this developmental period (Blakemore, 2008).

96

97   A number of cross-sectional and longitudinal observational community studies with young

98   people support an association between negative thoughts, self-focused attention, negative

99   self-imagery, and safety behaviours with social anxiety symptoms (Leigh & Clark, 2018). In

100 addition, a recent study with clinic-referred adolescents found that negative thoughts and

101 attitudes, self-focused attention and safety behaviours were elevated in young people with

102 SAD compared to young people with other anxiety disorders (Leigh, Percy, et al., 2023).

103 Experimental studies are a particularly powerful way to test the causal assumptions

104 underlying the Clark and Wells model. To date, experimental studies with young people that

105 have manipulated self-focused attention (Kley et al., 2011), safety behaviours and self-

106 focused attention (Leigh et al., 2021), and self-imagery (Leigh et al., 2020) during interaction

107 or performance tasks have found an association with increased state anxiety, more negative

108 self-appraisals, and impaired performance in high socially anxious community samples of

109 young people. However, few experimental studies have been carried out with clinical

110 samples.

111

112 Two trials of CT-SAD with adolescents have been reported. A Norwegian trial randomly

113 allocated 57 adolescents to individual CT-SAD, group graded exposure based CBT, or an

114 attention placebo condition (equivalent contact time to active arms involving social activity

115 and support but without purported active treatment elements) (Ingul et al., 2014). Across all

116 outcome measures, the CT-SAD condition outperformed both graded CBT and attention

117 placebo at post-treatment assessment, although the comparison between the treatment

118   arms was confounded by the type of delivery (group vs. individual). A UK trial compared CT-

119   SAD delivered online (called Online Social anxiety Cognitive therapy for Adolescents or

120   'OSCA') to waitlist in a sample of 43 young people aged 14–18 years with a diagnosis of SAD

121   recruited through schools (Leigh & Clark, 2019). Large, controlled effects were observed

122   across all outcome measures (Leigh & Clark, 2023) with a high level of treatment satisfaction

123   (Leigh, Nicol-Harper, et al., 2023), but further evaluation is needed with larger samples and

124   active comparators.

125

126   Examining the effects of specific components of CT-SAD with adolescents may offer us the

127   opportunity to further enhance outcomes by understanding which elements of CBT (Cohen

128   et al., 2023) yield clinical benefit as well as contributing to our understanding of mechanisms

129   of change (an approach that has been termed 'back translation'). With this intention, we

130   used data from the UK waitlist-controlled trial of OSCA (Leigh & Clark, 2023) to examine the

131   effects of two elements of the treatment with adolescents: (1) the *self-focused attention and*

132   *safety behaviour experiment* and (2) *video feedback*, on self-reported anxiety and self-

133   appraisals.

134

135   We hypothesize that:

136   (1) In the *self-focused attention and safety behaviour experiment*, participants would

137   report lower anxiety and more positive self-appraisals when focusing externally and

138   dropping safety behaviours (hereon called the 'without' condition) compared to self-

139   focusing and using safety behaviours (called the 'with' condition).

140   (2) In *video feedback*, participants would report more positive appraisals of their

141   appearance and performance after watching a video compared to before.

142   (3) In *video feedback*, the differences in these outcomes (distortion scores) would be

143   significantly greater in the 'with' than in the 'without' condition.

144

145   In addition to hypothesis testing, this study using secondary data from a preliminary RCT of

146   OSCA aims to better understand the social fears and negative self-images typically

147   experienced by adolescents with a diagnosis of SAD during the two therapeutic procedures.

148   To do so, we conducted exploratory data analyses of patient reported social fears and

149   negative self-images using topic modelling.

150

151   **Methods**

152   **Participants**

153   The study used secondary data collected as part of a preliminary trial of OSCA.

154   Participants were 35 young people aged 14–18 years (89% female) recruited from four

155   secondary schools in southeast England with a primary DSM-5 diagnosis of SAD who had all

156   received OSCA as part of a randomised controlled trial (Trial registration: ISRCTN15079139);

157   University of Oxford Medical Sciences Division Research Ethics Committee approval:

158   R60464/RE001; Leigh & Clark, 2019), either immediately upon randomisation or after a 14-

159   week wait period (Details of participant characteristics can be found here). The trial included

160   43 participants in total. All those who completed the two treatment components (whether

161   or not they completed the trial) were included here (N=35).

162   A priori power analysis was not conducted. Although the value of post-hoc power

163   analysis is limited, they can inform interpretation of findings when based on predetermined

164   effect sizes. We assumed a large effect size based on previous studies (McManus & Clark,

165   2009; Wild et al., 2023). At p<.05 with 35 participants, we would have 90% power to detect a

166   large effect. The hypotheses and analyses were not pre-registered.

167

168   **Procedure and Measures**

169   For the *self-focused attention and safety behaviour experiment*, participants

170   identified their social fears before engaging in the social interaction task. Then after each

171   interaction the following self-ratings were taken, each on a scale of 0–100: the extent to

172   which they believed their particular social fears had been realised (*average social fear*

173   *belief*); how anxious they felt (*anxious feeling*); how anxious they thought they looked

174   (*anxious appearance*); and how well they thought they performed (*performance*). In

175   addition, they indicated how much they used their safety behaviours and how self-focused

176   they were after each interaction.

177   In *video feedback*, participants reviewed the videos of the two interactions carried

178   out as part of the *self-focused attention and safety behaviour experiment* in the order that

179   they had been carried out. Before watching the videos, young people completed sections of

180   OSCA guiding them in how to watch the videos back. The content follows the procedure

181   outlined in Warnock-Parkes et al. (2017). As part of the preparation, participants were asked

182   to describe in detail what they expected to see in the videos. The description associated

183   with the first conversation represents their 'negative self-image', which was used in topic

184   modelling. Before and after each video, young people rated the extent to which they

185   believed their anticipated social fears would be/had been realised (*average social fear*

186   *belief*); how anxious they thought they would look/did look (*anxious appearance*), and how

187   well they thought they would do/did do (*performance*).

188

189 **Data Analysis**

190 Data was analysed in R Studio (R Core Team, 2024). Paired samples *t*-tests were used to

191 assess whether there were statistically significant differences in outcomes between the

192 '*with*' and '*without*' condition (Hypothesis 1) and before and after watching videos

193 (Hypothesis 2). The outcomes were: average social fear belief, anxious feeling, anxious

194 appearance, and performance. Shapiro-Wilk normality tests were performed to examine

195 data normality, and statistical assumptions for parametric test were met for all the analyses.

196 Paired samples *t*-tests were used to examine if distortion scores were higher in the '*with*'

197 compared to the '*without*' condition (Hypothesis 3). We applied Bonferroni correction with

198 an adjusted alpha value of .0025 to correct for multiple testing. One participant reported

199 missing value on safety behaviour and one participant did not report their beliefs and

200 feelings after watching videos. Excluding these data points from our analyses did not change

201 the statistical significance of our test results.

202

203 We conducted Latent Dirichlet Allocation (LDA) to explore possible themes of participant

204 reported social fears and negative self-imagery, using the *textmineR* package (Jones et al.,

205 2018). LDA is a probabilistic topic modelling technique that is used to discover latent topics

206 from text documents. It assumes each text document consists of a mixture of topics, and

207 each topic is a set of words that frequently co-occur. It identifies which topics are present in

208 each document and to what extent. It also determines which words are most representative

209 for each topic. It uses an iterative process to refine these distributions. This method has

210 been increasingly applied in psychology research to identify latent topics from text data

211 (Chiu et al., 2022; Hagg et al., 2022).

212

213   To conduct LDA, we created a document-term matrix representing the frequency of

214   occurrence of each term. Preprocessing steps were applied: Lowercasing, removing

215   punctuations and numbers, eliminating stop words, stemming (e.g. from 'long_pause' to

216   'long_paus'), and removing infrequent words. We then applied LDA to the pre-processed

217   document-term matrix, considering n-gram up to three words to capture relevant phrases.

218   The LDA model was fitted using Gibbs sampling with 2000 iterations. Hyperparameters alpha

219   and beta were set to 0.1 and 0.5 respectively. The resulting topics were interpreted by

220   examining the top five terms for each topic. We tested models with k ranging from 2–50,

221   evaluating each using coherence scores. Coherence measures the degree of similarity

222   between words within a topic. The higher the coherence value, the better the topic quality.

223   In addition to coherence, we estimated the prevalence of each topic, which indicates how

224   much a particular topic is presented across all data points. We reported a LDA model with a

225   k value that produced the highest average coherence score across topics. When using LDA,

226   words may be grouped together simply because they frequently appear together, not

227   because they are semantically related. To address this limitation, we reviewed how the

228   terms appear in source documents by searching the term in the raw dataset, and considered

229   the semantic coherence of terms within each topic. In line with the LDA Preferred Reporting

230   Checklist (Hagg et al., 2022), we evaluated the relationships among topics by examining the

231   intertopic distance maps generated by the *LDAvis* R package (Sievert & Shirley, 2014). These

232   maps provide a visual representation of the relationships between topics. Each circle

233   represents a topic, with its size representing its prevalence. The distance between the circle

234   indicates how distinct the topics are from each other. Topics that are closer together on the

235   map share more common words and are thematically similar.

236

237   **Results**

238   **Self-focused Attention and Safety Behaviour Experiment**

239   Participants rated themselves as significantly less self-focused (t(33) = 14.26, p < .001)) and

240   reduced use of safety behaviours (t(33) = 15.77, p < .001)) in the '*without*' condition than in

241   the '*with*' condition, suggesting the intended experimental manipulation was successful. In

242   line with Hypothesis 1, participants in the '*without*' condition reported feeling less anxious,

243   and believing that they looked less anxious, that their feared social outcomes were less likely

244   to have occurred, and they had performed better, when compared with their ratings in the

245   '*with*' condition (See Table 1).

246

247   **Table 1. Paired sample t-tests for participants' ratings of average social fear belief, anxious**

248   **feeling, anxious appearance, and performance (N = 34)**

Outcome	With condition		Without condition		t(df)	d
	M	SD	M	SD		
Average social fear belief	56.58	21.60	22.24	15.14	t(33) = 10.11*	1.73
Anxious feeling	77.50	16.48	34.64	21.48	t(33) = 9.95*	1.71
Anxious appearance	68.53	21.27	29.18	20.42	t(33) = 10.02*	1.72
Performance	47.35	17.02	73.91	14.00	t(33) = -7.74*	-1.33

249   Note. * p < .0025. M = Mean, SD = Standard Deviation, t = t statistic, df = degrees of
250   freedom, d = Cohen's d.
251

252   Participants reported 140 descriptions of negative social outcomes that they feared may

253   occur during the conversations. Examples included, '*I will not make sense*', '*I will have*

254   *nothing to say*', '*there will be long silences*'. The optimal number of topics (k) was

255   determined based on the highest average coherence score, which peaked at six topics (see

256   Figure S1A). The coherence and prevalence values of each topic are presented in Table 2.

257   The most prevalent topic was 'long_paus'. 'The topic '*overli_nice*' has the lowest coherence

258 (0.08), meaning that the words within this topic were not closely related to each other. In

259 Figure S2A, the intertopic distance map shows that the topics are well-separated, meaning

260 these topics are distinct from each other.

261

262 **Table 2. Results of Topic Modelling for Social Fears**

Topic	Label	Coherence	Prevalence	Top terms
1	long_paus	0.23	24.52	long, silenc, awkward, paus, long_paus
2	make_sens	0.30	21.50	make, weird, make_sens, sens, thing
3	person_bore	0.11	16.94	bore, person, convers, disinterest, uninterest
4	overli_nice	0.08	14.89	uncomfort, fidget, nice, awkward, person
5	stumble_word	0.25	12.08	word, stumbl, stumb_word, babble, strang
6	facial_express	0.55	10.07	stupid, express, facial, facial_express, idiot

263

264 **Video Feedback**

265 In line with Hypothesis 2, Table 3 shows that participants believed that they looked less

266 anxious and performed better after video feedback compared to the predictions that they

267 had made beforehand.

268

269 **Table 3. Paired Sample *t*-tests of Anxious Appearance, Performance, Perceived Anxious**

270 **Appearance, and Average Social Fear Belief, Before and After**

Condition (N)	Outcome	Before		After		t(df)	d
		M	SD	M	SD		
With (35)	Anxious appearance	78.26	9.77	37.77	19.98	$t(34) = 12.13^*$	2.05
	Performance	37.86	15.99	67.26	15.93	$t(34) = -7.83^*$	-1.32
	Average social fear belief	66.18	15.86	24.86	17.75	$t(34) = 14.75^*$	2.49
Without (34)	Anxious appearance	40.29	20.15	15.18	16.15	$t(33) = 7.42^*$	1.27
	Performance	68.69	17.14	81.09	16.84	$t(33) = -3.50^*$	-0.60

Average social fear belief	34.30	18.08	9.36	10.51	$t(33) = 8.84^*$	1.52

271 *Note*. * $p < .0025$. *N* = Sample size, *M* = Mean, *SD* = Standard Deviation, *t* = *t* statistic, *df* =
272 degrees of freedom, *d* = Cohen's *d*.
273

274 Consistent with Hypothesis 3, Table 4 shows that participants reported significantly higher

275 distortion scores in terms of their anxious appearance, performance, perceived anxious

276 appearance, and average social fear belief in the '*with*' compared to the '*without*' condition.

277 These results suggest the differences between what they predicted beforehand and their

278 judgements after viewing the videos were greater in magnitude when they self-focussed

279 and used safety behaviours, compared to when they focussed externally and dropped safety

280 behaviours.

281

282 **Table 4. Paired Sample t-tests for Distortion Scores Between 'with' and 'without'**

283 **Conditions (*N* = 34).**

Distortion scores	With		Without		t(df)	d
	M	*SD*	*M*	*SD*		
Anxious appearance	41.09	19.71	25.12	19.93	$t(33) = 5.18^*$	0.88
Performance	-30.26	-21.94	-12.5	-20.85	$t(33) = -5.19^*$	-0.89
Average social fear belief	40.48	16.03	24.94	16.45	$t(33) = 3.35^*$	0.92

284 Note: * $p < .0025$, *M* = Mean, *SD* = Standard Deviation, *t* = *t* statistic, *df* = degrees of
285 freedom, *d* = Cohen's *d*.
286
287 Before watching themselves on videos, participants were asked to describe how they

288 thought they would look in the videos (*N* = 35). When there were five optimal topics the

289 average coherence value across topics was the highest (See Figure S1B). As shown in Table 5,

290 the most prevalent topic relates to eye contact (Topics 1 and 3). The topic named '*fidget_*

291 *hand*' had the lowest coherence (0.07), meaning that the top terms within this topic were

292 loosely related to each other. Figure S3 shows that these five topics form three clusters, with

293 Topics 1 and 3 as well as Topics 2 and 5, overlapping each other.

294

295 **Table 5. Results of Topic Modelling for Negative Self-images**

Topic	Label	Coherence	Prevalence	Top Terms
1	ey_contact	0.29	34.72	contact, ey_contact, ey, avoid, convers
2	fidget_hand	0.07	29.25	awkward, hand, nervou, red, talk, fidget
3	make_ey	0.49	13.45	make, ey, make_ey, make_ey_contact, contact
4	long_paus	0.28	13.39	paus, long, long_paus, speech, face, fidget
5	facial_express	0.30	9.19	nervou, uninterested, bore, shy, sound

296

297 **Discussion**

298 The current findings build on previous studies with community samples of adolescents that

299 have indicated the relevance of self-focused attention, safety behaviours and negative self-

300 imagery to the persistence of social anxiety by pointing to their role in social anxiety

301 amongst treatment-seeking young people, and to the value of the 'self-focused attention

302 and safety behaviour experiment' and 'video feedback' as therapeutic techniques. These

303 findings extend previous research on internet-delivered CT-SAD with adults, demonstrating

304 that these two procedures from face-to-face CT-SAD can be effectively deployed in an online

305 format and it will be important to replicate the finding in larger samples in future.

306

307 The 'self-focused attention and safety behaviour experiment' findings shed light on the

308 effects of these processes on social anxiety. Specifically, in line with our first hypothesis,

309 increasing self-focus and safety behaviour use during an interaction task was associated with

310 higher anxiety and more critical self-judgements of anxious appearance and overall

311 performance compared to reducing self-focus and safety behaviour use. Previous studies

312 have demonstrated this finding in community samples (Leigh et al., 2021). To our knowledge

313   this is the first study with a clinical sample, providing further support for the causal role of

314   these processes in adolescent social anxiety, although the extent to which the observed

315   effects are driven specifically by self-focused attention or by safety behaviours cannot be

316   inferred because they were manipulated concurrently.

317

318   Findings from the 'video feedback' component are informative about the relevance of

319   negative self-imagery to social anxiety. In line with our second hypothesis, we observed that

320   individuals' perceptions of their anxious appearance and performance were substantially

321   less negative after they had watched themselves on the video compared to before. Three

322   previous experimental studies have reported the effects of manipulating imagery with

323   socially anxious young people. Two used verbal instruction. In a community sample of high

324   socially anxious adolescents Leigh et al. (2020) found that negative self-imagery was

325   associated with significantly higher anxiety and self-perceptions compared to benign

326   imagery during a social interaction task, contributing to an overestimation of anxious

327   appearance compared to other peoples' perception. Using a between-subjects design,

328   Alfano et al. (2008) compared anxiety and performance ratings of a performance task

329   between three groups of adolescents: those with a diagnosis of SAD; a community sample

330   instructed to engage in negative self-imagery; and a community sample given no

331   instructions. The clinical group were more anxious and performed worse compared to the

332   two groups, which speaks against the suggestion that negative self-imagery is causally

333   implicated in social anxiety. However, it is difficult to draw firm conclusions from this study

334   because neither the clinical nor the '*no instruction*' community group were given any

335   instructions and so we cannot determine the thought content during the task. A third study

336   manipulated negative imagery in high socially anxious young people using video feedback

337   with verbal preparation (rather than verbal instruction alone) (Parr & Cartwright-Hatton,

338   2009). Participants who received video feedback experienced improvements in anxiety and

339   self-perceptions of performance compared to those in the no-instruction control condition

340   who showed no change. The present study contributes to our knowledge base with findings

341   from a clinical sample and provides further support for the relevance of negative imagery to

342   the persistence of adolescent social anxiety. It also provides further support for the use of

343   video feedback as a means of manipulating imagery with young people.

344

345   The effect of video feedback on individuals' self-perceptions was large in both social

346   interactions, but consistent with our third hypothesis and the Clark and Wells account of

347   social anxiety, the effect was significantly larger in the '*with*' self-focused attention and

348   safety behaviours condition compared to '*without*'. This may be because self-focus enhances

349   access to internal information, such as distorted negative imagery, that is used to inform

350   appraisals of one's social appearance and performance and reduces awareness of external,

351   potentially disconfirmatory information, such as the other person's reactions in real time. In

352   contrast, when individuals were instructed to focus on the other person and reduce safety

353   behaviours, this contributed to greater awareness of external information and so a less

354   distorted self-perception.

355

356   Topic modelling indicated there are six types of social fear topics and five types of negative

357   self-image topics. Social fears predominantly revolve around one's speech, with participants

358   expressing concerns about pausing, coherence, stumbling over words, and other people's

359   reactions to their speech. Results suggest that individuals with SAD are particularly

360   concerned about their speech. Although concerns about facial expressions also emerged as

361   a topic, this topic is less common than speech-related fears (10% versus 75% prevalence).

362   Negative self-images similarly include concerns around speech (13% prevalence) and facial

363   expressions (9% prevalence) but fear around avoiding or not maintaining eye contact

364   emerges as the most dominant topic, with a 47% prevalence. In sum, while social fears and

365   negative self-images have similarities in content, there are also clear differences: social fear

366   likely pertains to fear of not speaking well, while negative self-images are often related to

367   difficulties with eye contact.

368

369   Whilst the study has strengths, including a clinical sample and an ecologically valid setting,

370   there are limitations worth noting. First, the sample size was modest which can amplify

371   effect sizes. Also, it was predominantly made up of girls, reflecting the wider sample

372   included in the trial. Future studies with a larger sample and better balance of boys and girls

373   would allow us to be more confident about the findings and to draw broader conclusions.

374   Second, the order of the two conditions in the self-focused attention and safety behaviour

375   experiment was not counterbalanced. This reflects the 'real world' nature of the study

376   because the '*self-focused attention and safety behaviour experiment*' is undertaken in this

377   order as standard in treatment, but it means we cannot rule out the possibility that there is

378   an order effect whereby participants typically feel more anxious and perform more poorly in

379   the first conversation compared to the second. However, the studies of Leigh et al. (2021)

380   with adolescents, and McManus et al. (2008, 2009) with adults that examined the same

381   paradigm did counterbalance order of the two conditions and the effect persisted. Third, the

382   reliance on self-report measures means we cannot draw conclusions about whether the

383   perceived effects of the conditions translated to effects on actual social performance.

384   Fourth, only data collected within one session of therapy undertaken in the trial is reported,

385 but studies including follow-up data on symptoms over time would give insights into the

386 persistence of effects. Fifth, whilst LDA is a data-driven approach to identify latent topics,

387 human interpretations of these topics and their relationships remain essential. Therefore,

388 whilst LDA identifies topics through statistical co-occurrence patterns, human judgement is

389 necessary to validate their semantic meaning and contextual relationships. This human

390 validation process inherently introduces some degree of subjectivity. Sixth, the use of single

391 item measures is liable to random measurement error, reduced reliability, and

392 misinterpretation. Development of valid and reliable brief multi-item measures of the

393 outcomes of interest will be valuable for future studies.

394

395 The findings have clinical implications. Anecdotally we know that clinicians can have

396 hesitations about delivering these two therapy procedures due to concerns about distressing

397 their young patients. However, our finding that each procedure is associated with large

398 positive changes in anxiety and self-evaluation when undertaken early in the course of

399 therapy (in week two of OSCA), as is standard, points to their value and aligns with findings

400 from a qualitative study of CT-SAD with young people, parents, and clinicians that the most

401 salient features of the treatment are 'difficult, but good' (Taylor et al., 2021). Considering the

402 discovery of specific themes for social fears and negative self-imagery, clinicians are

403 encouraged to attend to these unique concerns of their clients at formulation and treatment

404 stages. A further concern clinicians raise is about delivering therapy techniques which they

405 anticipate young people may find challenging, such as the self-focused attention and safety

406 behaviour experiment and video feedback, in an online setting. The findings from the

407 present study directly speak to this concern and suggest that these two core elements of CT-

408 SAD can be successfully translated to an online setting.

409

410   There are several directions for future research. One avenue is to understand how

411   generalisable the study findings are to other groups. It may be helpful to explore if any

412   modifications are required for younger children under 14 years old, as well as socially

413   anxious individuals who have social communication deficits, speech and language

414   difficulties, or attentional deficits. Another way is to examine whether the effect persists in

415   other social tasks, such as public speaking or group discussion. One further direction is to

416   explore ways that could make these intervention components more accessible, such as

417   having them delivered by non-specialised clinicians.

418

419   Whilst there have been a small number of studies examining the efficacy of the self-focused

420   attention and safety behaviour experiment (McManus & Clark, 2009; Schreiber et al., 2015;

421   Furakawa et al., 2009) and video feedback (McManus & Clark, 2009; Wild et al., 2023;

422   Furakawa et al., 2009; Laposa & Rector, 2014; Laposa & Rector, 2023; Warnock-Parkes et al.,

423   2017) in the context of treatment, to our knowledge none have been reported with young

424   people. There is value in replication studies to increase our confidence in the findings and

425   we hope that the present study will contribute to this endeavour. Our study aimed to look at

426   the effects of two key elements of CT-SAD with a sample of young people with SAD, to add

427   to our understanding of mechanisms of change and improve outcomes (Cohen et al., 2023).

428   Our findings suggest self-focused attention, safety behaviours, and negative self-imagery are

429   relevant targets of treatment in adolescent social anxiety and can be usefully modified with

430   the *self-focused attention and safety behaviour experiment* and *video feedback* as part of CT-

431   SAD.

432

433   **References**

434

435   Alfano, C. A., Beidel, D. C., & Turner, S. M. (2008). Negative self-imagery among adolescents

436   with social phobia: A test of an adult model of the disorder. *Journal of Clinical Child &*

437   *Adolescent Psychology*, *37*(2), 327–336.

438   https://doi.org/10.1080/15374410801955870

439   Blakemore, S.-J. (2008). Development of the social brain during adolescence. *Quarterly*

440   *Journal of Experimental Psychology*, *61*(1), 40–49.

441   https://doi.org/10.1080/17470210701508715

442   Bruce, S. E., Yonkers, K. A., Otto, M. W., Eisen, J. L., Weisberg, R. B., Pagano, M., Shea, M. T.,

443   & Keller, M. B. (2005). Influence of psychiatric comorbidity on recovery and

444   recurrence in generalized anxiety disorder, social phobia, and panic disorder: A 12-

445   year prospective study. *The American Journal of Psychiatry*, *162*(6), 1179–1187.

446   https://doi.org/10.1176/appi.ajp.162.6.1179

447   Chiu, K., Clark, D. M., & Leigh, E. (2021). Prospective associations between peer functioning

448   and social anxiety in adolescents: A systematic review and meta-analysis. *Journal of*

449   *Affective Disorders*, *279*, 650–661.

450   Chiu, K., Clark, D. M., & Leigh, E. (2022). Characterising negative mental imagery in

451   adolescent social anxiety. *Cognitive Therapy and Research*, *46*(5), 956–966.

452   Chiu, K., Stringaris, A., & Leigh, E. (2024). Social anxiety symptoms and their relationship

453   with suicidal ideation and depressive symptoms in adolescents: A prospective study.

454   *JCPP Advances*, e12249. https://doi.org/10.1002/jcv2.12249

455   Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In *Social phobia:*

456   *Diagnosis, assessment, and treatment* (pp. 69–93). The Guilford Press.

457   Cohen, Z. D., Barnes-Horowitz, N. M., Forbes, C. N., & Craske, M. G. (2023). Measuring the

458   active elements of cognitive-behavioral therapies. *Behaviour Research and Therapy*,

459   *167*, 104364. https://doi.org/10.1016/j.brat.2023.104364

460   Evans, R., Chiu, K., Clark, D. M., Waite, P., & Leigh, E. (2021). Safety behaviours in social

461   anxiety: An examination across adolescence. *Behaviour Research and Therapy*, *144*,

462   103931.

463   Furukawa, T. A., Chen, J., Watanabe, N., Nakano, Y., Ietsugu, T., Ogawa, S., Funayama, T., &

464   Noda, Y. (2009). Videotaped experiments to drop safety behaviors and self-focused

465   attention for patients with social anxiety disorder: Do they change subjective and

466   objective evaluations of anxiety and performance? *Journal of Behavior Therapy and*

467   *Experimental Psychiatry*, 40(2), 202-210. https://doi.org/10.1016/j.jbtep.2008.08.003

468   Hagg, L. J., Merkouris, S. S., O'Dea, G. A., Francis, L. M., Greenwood, C. J., Fuller-Tyszkiewicz,

469   M., Westrupp, E. M., Macdonald, J. A., & Youssef, G. J. (2022). Examining analytic

470   practices in latent dirichlet allocation within psychological science: Scoping review.

471   *Journal of Medical Internet Research*, *24*(11), e33166. https://doi.org/10.2196/33166

472   Hirsch, C. R., Clark, D. M., Mathews, A., & Williams, R. (2003). Self-images play a causal role

473   in social phobia. *Behaviour Research and Therapy*, *41*(8), 909–921.

474   https://doi.org/10.1016/S0005-7967(02)00103-1

475   Hirsch, C. R., Meynen, T., & Clark, D. M. (2004). Negative self-imagery in social anxiety

476   contaminates social interactions. *Memory*, *12*(4), 496–506.

477   https://doi.org/10.1080/09658210444000106

478   Ingul, J. M., Aune, T., & Nordahl, H. M. (2014). A randomized controlled trial of individual

479   cognitive therapy, group cognitive behaviour therapy and attentional placebo for

480   adolescent social phobia. *Psychotherapy and Psychosomatics*, *83*(1), 54–61.

481   https://doi.org/10.1159/000354672

482   Jones, T., Doane, W., Attbom, M., & Jones, M. T. (2018). *TextmineR: Functions for text mining*

483   *and topic modeling*. https://CRAN.R-project.org/package=textmineR

484   Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005).

485   Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the

486   national comorbidity survey replication. *Archives of General Psychiatry*, *62*(6), 593–

487   602. https://doi.org/10.1001/archpsyc.62.6.593

488   Kley, H., Tuschen-Caffier, B., & Heinrichs, N. (2011). Manipulating self-focused attention in

489   children with social anxiety disorder and in socially anxious and non-anxious children.

490   *Journal of Experimental Psychopathology*, *2*(4), 551–570.

491   https://doi.org/10.5127/jep.014511

492   Laposa, J. M., & Rector, N. A. (2014). Effects of videotaped feedback in group cognitive

493   behavioral therapy for social anxiety disorder. *International Journal of Cognitive*

494   *Therapy*, 7(4), 360-372. https://doi.org/10.1521/ijct.2014.7.4.360

495   Laposa, J.M., Rector, N.A. (2023). The Impact of Group Feedback on Self-Perceptions

496   Following Videotape Exposure in CBT for Social Anxiety Disorder. *Behavior*

497   *Modification*, 47(3), 573-589.

498   https://psycnet.apa.org/doi/10.1177/01454455221118349

499   Leigh, E., Chiu, K., & Clark, D. M. (2020). The effects of modifying mental imagery in

500   adolescent social anxiety. *PLOS ONE*, *15*(4), e0230826.

501   https://doi.org/10.1371/journal.pone.0230826

502   Leigh, E., Chiu, K., & Clark, D. M. (2021). Self-focused attention and safety behaviours

503   maintain social anxiety in adolescents: An experimental study. *PLOS ONE*, *16*(2),

504   e0247703. https://doi.org/10.1371/journal.pone.0247703

505   Leigh, E., & Clark, D. M. (2018). Understanding social anxiety disorder in adolescents and

506   improving treatment outcomes: Applying the cognitive model of Clark and Wells

507   (1995). *Clinical Child and Family Psychology Review*, *21*(3), 388–414.

508   https://doi.org/10.1007/s10567-018-0258-5

509   Leigh, E., & Clark, D. M. (2019). Online Social anxiety Cognitive therapy for Adolescents

510   (OSCA): Protocol for a randomised controlled trial. *Trials*, *20*(1), 574.

511   https://doi.org/10.1186/s13063-019-3651-6

512   Leigh, E., & Clark, D. M. (2023). Internet-delivered therapist-assisted cognitive therapy for

513   adolescent social anxiety disorder (OSCA): A randomised controlled trial addressing

514   preliminary efficacy and mechanisms of action. *Journal of Child Psychology and*

515   *Psychiatry*, *64*(1), 145–155. https://doi.org/10.1111/jcpp.13680

516   Leigh, E., Nicol-Harper, R., Travlou, M., & Clark, D. M. (2023). Adolescents' experience of

517   receiving internet-delivered cognitive therapy for social anxiety disorder. *Internet*

518   *Interventions*, *34*, 100664. https://doi.org/10.1016/j.invent.2023.100664

519   Leigh, E., Percy, R., Clark, D. M., Creswell, C., & Waite, P. (2023). Cognitive and behavioural

520   processes in adolescents with social anxiety disorder. *Behaviour Research and*

521   *Therapy*, *170*, 1–7. https://doi.org/10.1016/j.brat.2023.104416

522   Mayo-Wilson, E., Dias, S., Mavranezouli, I., Kew, K., Clark, D. M., Ades, A. E., & Pilling, S.

523   (2014). Psychological and pharmacological interventions for social anxiety disorder in

524   adults: A systematic review and network meta-analysis. *The Lancet Psychiatry*, *1*(5),

525   368–376. https://doi.org/10.1016/S2215-0366(14)70329-3

526   McManus, F., Clark, D. M., Grey, N., Wild, J., Hirsch, C., Fennell, M., Hackmann, A.,

527   Waddington, L., Liness, S., & Manley, J. (2009). A demonstration of the efficacy of two

528   of the components of cognitive therapy for social phobia. *Journal of Anxiety*

529   *Disorders*, *23*(4), 496–503. https://doi.org/10.1016/j.janxdis.2008.10.010

530   McManus, F., Sacadura, C., & Clark, D. M. (2008). Why social anxiety persists: An

531   experimental investigation of the role of safety behaviours as a maintaining factor.

532   *Journal of Behavior Therapy and Experimental Psychiatry*, *39*(2), 147–161.

533   https://doi.org/10.1016/j.jbtep.2006.12.002

534   Ng, A. S., Abbott, M. J., & Hunt, C. (2014). The effect of self-imagery on symptoms and

535   processes in social anxiety: A systematic review. *Clinical Psychology Review*, *34*(8),

536   620–633. https://doi.org/10.1016/j.cpr.2014.09.003

537   Norton, A. R., & Abbott, M. J. (2017). Bridging the gap between aetiological and maintaining

538   factors in social anxiety disorder: The impact of socially traumatic experiences on

539   beliefs, imagery and symptomatology. *Clinical Psychology & Psychotherapy*, *24*(3),

540   747–765. https://doi.org/10.1002/cpp.2044

541   Parr, C. J., & Cartwright-Hatton, S. (2009). Social anxiety in adolescents: The effect of video

542   feedback on anxiety and the self-evaluation of performance. *Clinical Psychology &*

543   *Psychotherapy*, *16*(1), 46–54. https://doi.org/10.1002/cpp.599

544   Piccirillo, M. L., Taylor Dryman, M., & Heimberg, R. G. (2016). Safety behaviors in adults with

545   social anxiety: Review and future directions. *Behavior Therapy*, *47*(5), 675–687.

546   https://doi.org/10.1016/j.beth.2015.11.005

547   R Core Team. (2024). *R: A language and environment for statistical computing* [Computer

548   software]. R Foundation for Statistical Computing. https://www.R-project.org/

549   Schreiber, F., Heimlich, C., Schweitzer, C., & Stangier, U. (2015). Cognitive therapy for social

550   anxiety disorder: the impact of the "self-focused attention and safety behaviours

551   experiment" on the course of treatment. *Behavioural and Cognitive Psychotherapy*,

552   *43*(02), 158-166. https://doi.org/10.1017/S1352465813000672

553   Sievert, C., & Shirley, K. (2014). LDAvis: A method for visualizing and interpreting topics. In J.

554   Chuang, S. Green, M. Hearst, J. Heer, & P. Koehn (Eds.), *Proceedings of the Workshop*

555   *on Interactive Language Learning, Visualization, and Interfaces* (pp. 63–70).

556   Association for Computational Linguistics. https://doi.org/10.3115/v1/W14-3110

557   Skumsnes, T., Fjermestad, K. W., Wergeland, G. J., Aalberg, M., Heiervang, E. R., Kodal, A., &

558   Ingul, J. M. (2024). Behavioral inhibition and social anxiety disorder as predictors of

559   long-term outcomes of cognitive behavioral therapy for youth anxiety disorders.

560   *Research on Child and Adolescent Psychopathology*, *52*(9), 1427–1439.

561   https://doi.org/10.1007/s10802-024-01215-8

562   Solmi, M., Radua, J., Olivola, M., Croce, E., Soardo, L., Salazar de Pablo, G., Il Shin, J.,

563   Kirkbride, J. B., Jones, P., Kim, J. H., Kim, J. Y., Carvalho, A. F., Seeman, M. V., Correll, C.

564   U., & Fusar-Poli, P. (2022). Age at onset of mental disorders worldwide: Large-scale

565   meta-analysis of 192 epidemiological studies. *Molecular Psychiatry*, *27*(1), 281–295.

566   https://doi.org/10.1038/s41380-021-01161-7

567   Taylor, L., Creswell, C., Pearcey, S., Brooks, E., Leigh, E., Stallard, P., Waite, P., Clark, D. M.,

568   Stephens, G., & Larkin, M. (2021). Delivering cognitive therapy for adolescent social

569   anxiety disorder in NHS CAMHS: A qualitative analysis of the experiences of young

570   people, their parents and clinicians-in-training. *Behavioural and Cognitive*

571   *Psychotherapy*, 1–15. https://doi.org/10.1017/S1352465821000047

572   Vilaplana-Pérez, A., Pérez-Vigil, A., Sidorchuk, A., Brander, G., Isomura, K., Hesselmark, E.,

573   Kuja-Halkola, R., Larsson, H., Mataix-Cols, D., & Fernández de la Cruz, L. (2021). Much

574   more than just shyness: The impact of social anxiety disorder on educational

575   performance across the lifespan. *Psychological Medicine*, *51*(5), 861–869.

576   https://doi.org/10.1017/S0033291719003908

577   Warnock-Parkes, E., Wild, J., Stott, R., Grey, N., Ehlers, A., & Clark, D. M. (2017). Seeing is

578   believing: Using video feedback in cognitive therapy for social anxiety disorder.

579   *Cognitive and Behavioral Practice*, *24*(2), 245–255.

580   https://doi.org/10.1016/j.cbpra.2016.03.007

581   Wild, J., Warnock-Parkes, E., Stott, R., Kwok, A. P. L., Lissillour Chan, M. H., Powell, C. L. Y. M.,

582   Leung, P. W. L., Clark, D. M., & Thew, G. R. (2023). Video feedback to update negative

583   self-perceptions in social anxiety disorder: A comparison of internet-delivered vs

584   face-to-face cognitive therapy formats. *Journal of Affective Disorders*, *331*, 139–144.

585   https://doi.org/10.1016/j.jad.2023.03.017

586
587
588
589   **Supplementary Materials**
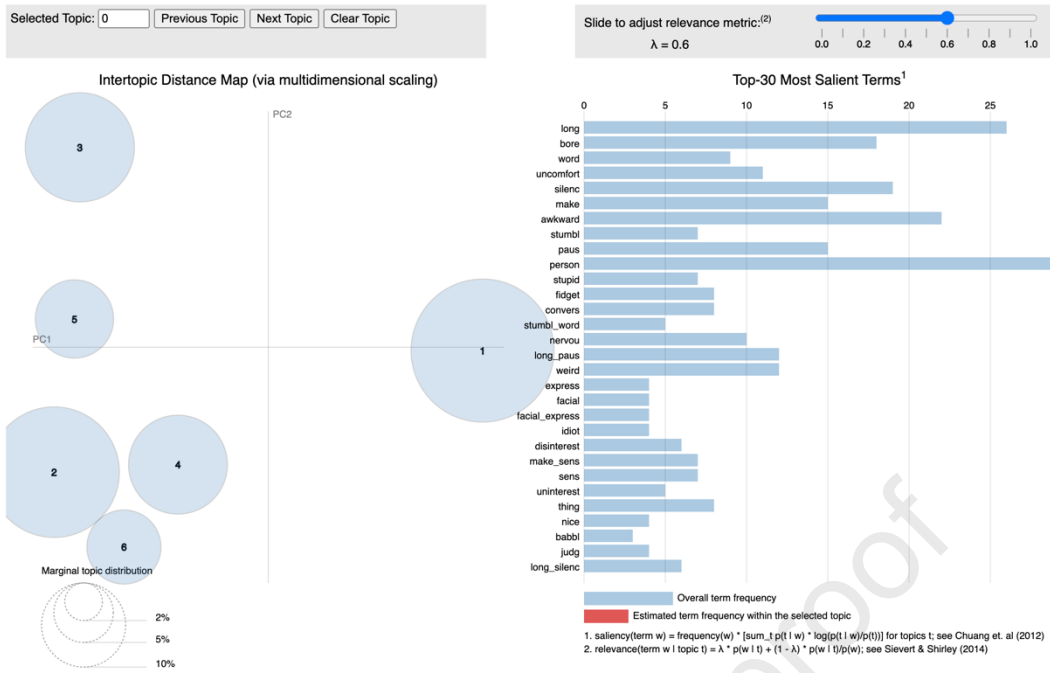
590   **Figure S1. Average Coherence Scores for Different Number of Topics: Social Fear (A) and**

591   **Negative Self-image (B)**

A	

Average Coherence for Different Number of Topics

B

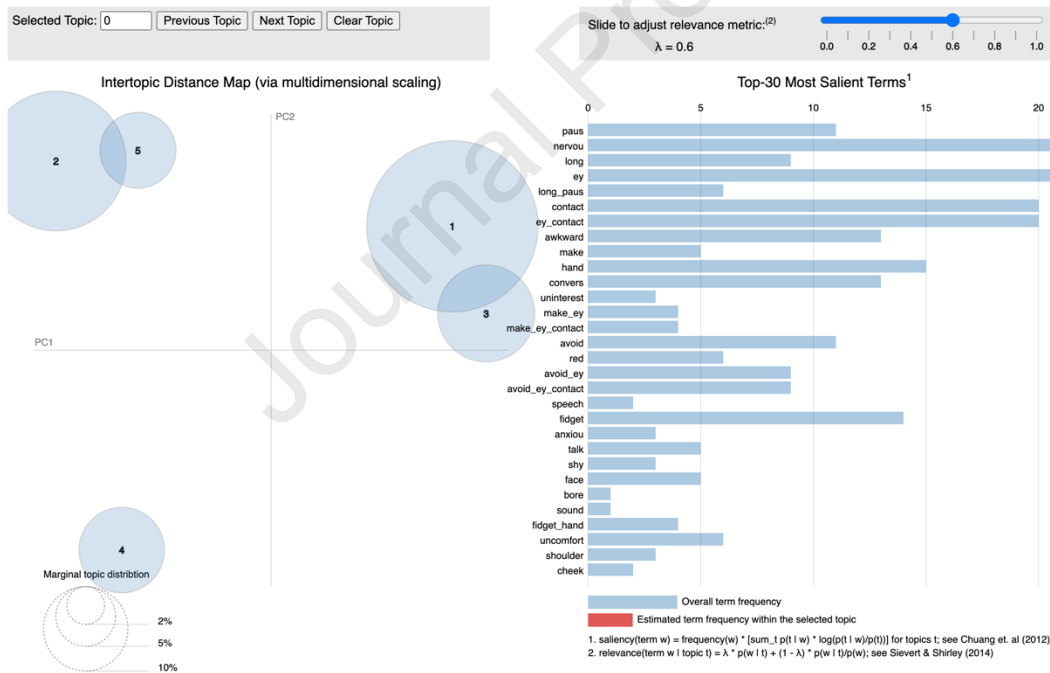**Average Coherence for Different Number of Topics**
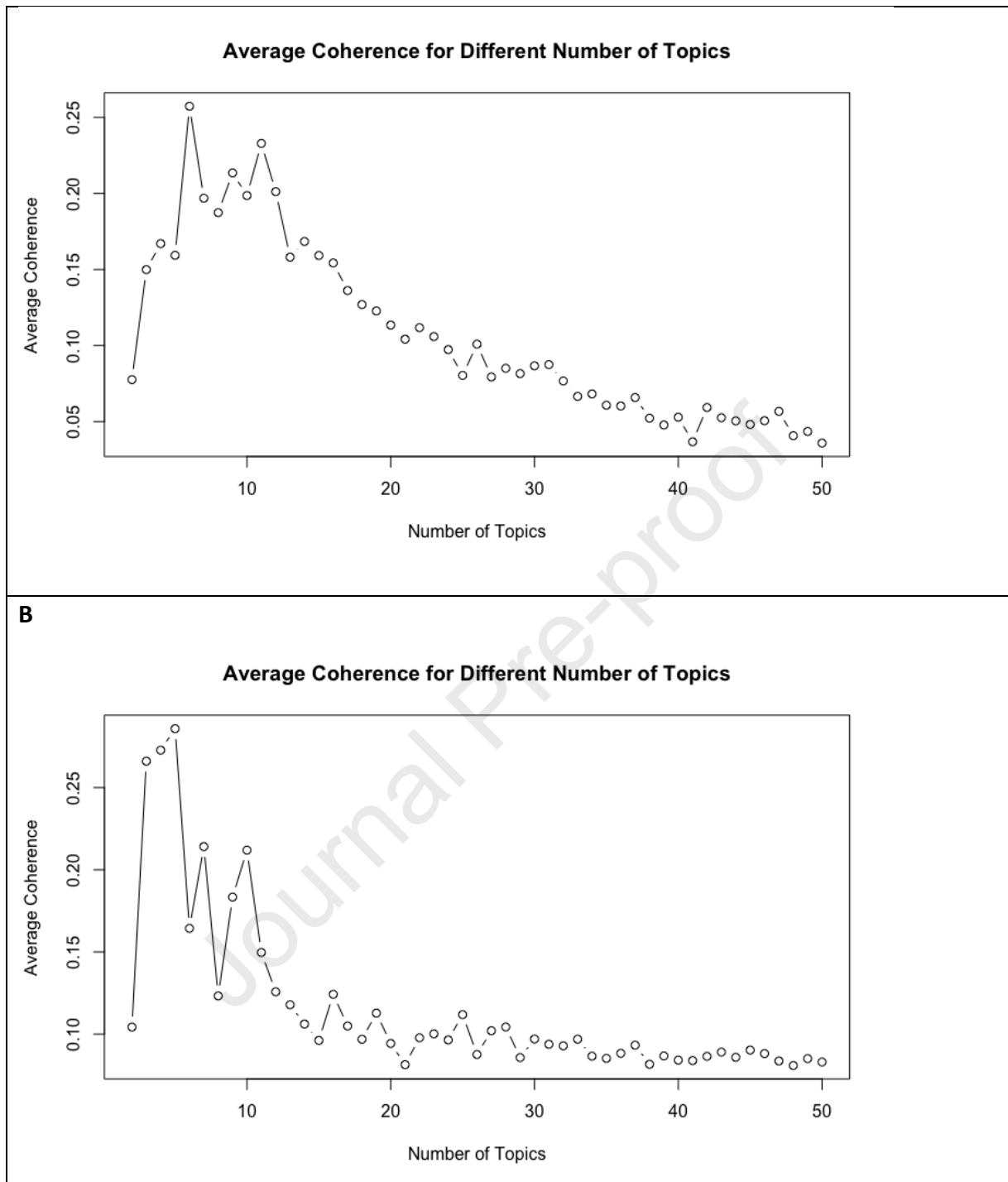
592

593   **Figure S2. Intertopic Distance map for Social Fears**

594

595 **Figure S3. Intertopic Distance Map for Negative Self-images**

596

597

598

Highlights

- *Self-focused attention and safety behaviour experiment* and *video feedback* are two key procedures in CT-SAD.

- We examined effects of these procedures on anxiety and self-perceptions in young people receiving an online version of CT-SAD.

- Both procedures were associated with large effects on anxiety and self-appraisals, pointing to their value in therapy.

- The most common themes in social fears were worries about verbal communication and in negative self-images were about eye contact.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: