

# Feasibility study of the e-learning version of the “Journey of the Brave”: A universal anxiety prevention program based on cognitive behavioral therapy

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## Research Article

**Keywords:** children’s anxiety, universal prevention program, internet-based cognitive behavioral therapy (I-CBT), e-learning, gamification, feasibility study

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1 **Feasibility study of the e-learning version of the “Journey of the Brave”:**  
2 **A universal anxiety prevention program based on cognitive behavioral**  
3 **therapy**

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22

## 23 **Abstract**

### 24 **Background**

25 School-based cognitive behavioral therapy (CBT) programs could contribute  
26 toward preventing anxiety disorders in children. However, setting aside class  
27 time for such programs is difficult. Internet-based CBT (I-CBT) is an efficient  
28 way to provide CBT. However, studies on I-CBT for anxiety prevention are still  
29 scarce, including I-CBT for school-based universal prevention programs.  
30 Therefore, we developed an e-learning version of a school-based anxiety  
31 prevention CBT program “Journey of the Brave,” which was effective in Japan,  
32 to make it more flexible and accessible. This study evaluated its feasibility.

### 33 **Methods**

34 We conducted a single-arm study with 44 parents and children. Children aged  
35 10-12 took the e-learning program at home. Parents and children responded to  
36 a questionnaire three times: before the learning (Pre), after the learning (Post),  
37 and three months later (FU: Follow-up). Feasibility was comprehensively

38 evaluated through dropout rates, satisfaction and learning records, and  
39 changes in scores on psychological scales.

## 40 **Results**

41 Of the 44 children, 42 started the e-learning, and 32 continued it (dropout rate  
42 of 23.8%). Furthermore, 83.9% of children and 96.8% of parents responded  
43 “agree” or “somewhat agree” regarding overall satisfaction. The parent-rated  
44 the Spence Children's Anxiety Scale (SCAS) (SCAS-P) showed a significant  
45 decrease between Pre and FU ( $p=0.014$ , 95%CI= (-9.22, -0.84)); however, the  
46 child-rated SCAS (SCAS-C) did not ( $p=0.08$ ). The Emotion-Regulation Skills  
47 Questionnaire (ERSQ) also increased significantly between Pre and FU  
48 ( $p=0.045$ , 95%CI= (0.18, 18.31)). Total Difficulties Score of the Strengths and  
49 Difficulties Questionnaire (SDQ) decreased significantly from Pre to Post  
50 ( $p=0.025$ , 95%CI= (-3.62, -0.19)); however, it was not significantly different  
51 between Pre and FU ( $p=0.67$ ).

## 52 **Conclusion**

53 The e-learning version showed low dropout rates and high satisfaction ratings  
54 from parents and children. Moreover, this study did not rule out the possibility  
55 that the program reduced children's anxiety and improved their emotional  
56 regulation skills. Therefore, its potential and feasibility were indicated.

57

58 **Keywords:** children's anxiety, universal prevention program, internet-based  
59 cognitive behavioral therapy (I-CBT), e-learning, gamification, feasibility study

60

## 61 **1. Background**

62 Anxiety disorders are common psychiatric disorders that present in early  
63 childhood [1], with a lifetime prevalence of approximately 15%–20% in children  
64 and adolescents [2]. Merikangas et al. reported that approximately 1 in 3  
65 adolescents met the diagnostic criteria for an anxiety disorder [3]. Anxiety  
66 disorders in childhood predict the maintenance of anxiety and other psychiatric  
67 disorders in adolescence [4]. Furthermore, anxiety disorders in adolescence  
68 also increase the risk of anxiety and depression in adulthood [5] and predict  
69 other psychiatric disorders, such as alcoholism and chronic stress, and life  
70 situations, such as social maladjustment and low income [6]. Since anxiety  
71 disorders in children and adolescents rapidly increase between the ages of 10–  
72 19 years [7], childhood prevention and early intervention are necessary [8].

73

74 In Japan, anxiety problems are a factor contributing to the increasing trend of  
75 children not attending school. According to a survey conducted by the Ministry

76 of Education, Culture, Sports, Science and Technology (MEXT), approximately  
77 half (51.8%) the reasons for non-attendance were “apathy and anxiety,” with  
78 the proportion increasing each year [9]. Recent concerns regarding mental  
79 health problems among children have been linked to COVID-19 [10,11], which  
80 has led to increasing interest in addressing anxiety in schools. Meta-analyses  
81 have repeatedly confirmed the effectiveness of anxiety prevention approaches  
82 implemented in schools, which are also practical [12,13]. Prevention  
83 approaches include the universal approach, which is not targeted, and  
84 approach for at-risk or symptomatic individuals (Institute of Medicine (US)  
85 Committee on Prevention of Mental Disorders, 1994). Since the universal  
86 approach does not create labeling and stigmatization [14], its adoption is  
87 appropriate to implement anxiety prevention programs in schools.

88  
89 Urao et al. noted that child anxiety prevention programs developed in certain  
90 countries did not always demonstrate the expected effects in other countries.  
91 Subsequently, they developed a school-based universal anxiety prevention  
92 program called “Journey of the Brave,” based on cognitive behavioral therapy  
93 (CBT), tailored to the Japanese cultural and social context [15]. The program  
94 was conducted by teachers who received six hours of training via a facilitator’s

95 manual [16]. However, it was structured around the work that children did on  
96 their own, and the learning content was designed to be understood by  
97 teacher's lectures and workbook reading. Previous studies suggested that  
98 school-based CBT programs were not as effective when delivered by teachers  
99 compared to by medical professionals [17,18]. However, the "Journey of the  
100 Brave" program demonstrated effectiveness in reducing anxiety among 10-12-  
101 year-olds even when presented by teachers [16,19]. However, in Japan, finding  
102 sufficient time to provide classes not stipulated by the MEXT was difficult.  
103 Furthermore, it placed a heavy burden on teachers in addition to in-class  
104 preparation. In addition, many schools suspended the program in 2021 owing  
105 to the COVID-19 pandemic that made it difficult to conduct face-to-face classes.  
106 Therefore, we considered ways to reduce the burden on schoolteachers and  
107 provide prevention programs flexibly.

108  
109 Internet-delivered CBT (I-CBT) is an effective treatment for psychiatric  
110 disorders in children [20]. I-CBT has received increasing attention owing to  
111 raised concerns regarding face-to-face treatment during the COVID-19  
112 pandemic [21]. Although not clearly defined, I-CBT can be broadly classified as  
113 guided or unguided and is a self-help format program with documents, audio,

114 and video [22]. I-CBT for anxiety disorders was more cost-effective than  
115 regular CBT treatment [23]. Guided I-CBT is comparable to face-to-face  
116 treatment in terms of session completion rates [24], although it required  
117 approximately one-eighth of the therapist's time [25]. Its effectiveness was also  
118 comparable to face-to-face sessions for children with anxiety disorders [26,27].  
119 However, despite meaningful reports on the treatment, studies on I-CBT  
120 programs for prevention are scarce and warrant future research [28].

121

122 Thus, we saw **the** potential of an e-learning version of the “Journey of the  
123 Brave” program. Since it was an individual work-based program with little  
124 interaction with teachers or classmates, it was relatively easy to convert  
125 written content into screen images. In addition, the Japanese government  
126 promoted a project called the GIGA (Global and Innovation Gateway for All)  
127 School Initiative [29] in response to the COVID-19 pandemic. Hence, most  
128 elementary and junior high schools now have one computer per student.  
129 Hence, if we can offer the program in a self-learning format through I-CBT,  
130 students can learn at their own pace at home or wherever they like, with  
131 teachers guiding them when necessary. If sufficient class time is unavailable,  
132 the program could be implemented flexibly, such as during self-study time,



133 which could reduce the burden on teachers. A recent study on the “Journey of  
134 the Brave” reported reduced anxiety scores, even when the program was  
135 divided into short classroom activities of 20 minutes. This demonstrated that  
136 the program was effective without necessarily using 45–50 minutes of  
137 classroom time at once [30]. Hence, we developed an e-learning version that  
138 allowed students to view class videos and answer work and tests over the  
139 Internet to make it more flexible and lower the burden on teachers owing to  
140 school implementation. "Journey of the Brave" is a school-based universal  
141 prevention program, and we envision an e-learning version also being offered  
142 in schools. However, simultaneously, fundamental verification is required to  
143 ensure that the e-learning version works correctly and that children can  
144 operate and understand it themselves as self-help material. Therefore, we  
145 aimed to evaluate the feasibility of the e-learning version at home rather than  
146 at school.

147

148

## 149 **2. Methods**

### 150 **2.1. Aim and Setting**

151 This study evaluated the feasibility of a newly developed e-learning version of  
152 “Journey of the Brave” via a single-arm intervention trial with no control group.  
153 Both parents and children participated. The intervention was provided only to  
154 the children; however, both completed a questionnaire to evaluate its  
155 feasibility. The study was approved by the Ethics Review Committee of Chiba  
156 University School of Medicine.

157

## 158 **2.2. Participants**

159 Participants were fifth- and sixth-grade students (aged 10–12 years) enrolled in  
160 regular classes. Furthermore, the same parent answered all the  
161 questionnaires. Since this was a preventive intervention program, we excluded  
162 children who were not attending school, enrolled in special-needs classes,  
163 diagnosed with developmental disabilities or psychiatric disorders, or attended  
164 psychiatric hospitals. We recruited participants through the official “Journey of  
165 the Brave” website and flyers distributed to approximately 1,500 children  
166 through several schools in the Chiba and Ibaraki prefectures from August to  
167 September 2022. Applications and informed consent forms were available on  
168 the web. Furthermore, participants could apply only if they had read and  
169 agreed to the written instructions. A plain language children's assent document

170 was also available on the web to ensure that both the parents and children  
171 were willing to participate.

172

### 173 **2.3. Intervention**

174 We developed an e-learning version to replicate the classroom experience on a  
175 computer. Learning modules, called stages, comprised eight learning stages  
176 and a review stage, similar to the original (Table 1). Primarily, participants  
177 watched the videos and answered the questions in a workbook, with between  
178 one and five works per stage. Each stage included one core work and check  
179 tests that participants answered on the e-learning system so that the  
180 administrator could review the content. Furthermore, homework was provided  
181 for each stage. We asked participants to allow at least one week between two  
182 stages to work on homework, with a maximum study period of six months.  
183 However, we left the actual learning cycle up to them, which allowed for  
184 flexibility. In addition, although the e-learning system was designed so that  
185 participants could not proceed to the next stage unless they had completed the  
186 previous video or work; for homework assignments, participants were allowed  
187 to proceed even if they had not submitted the work. The e-learning version,  
188 which required children to learn at their own pace and on their initiative, had

189 various features to encourage learning (Fig.1). We employed a system whereby  
190 participants earned points upon completion of a stage and submitting the  
191 homework results. Participants earned new items and characters as they  
192 accumulated points and progressed through the levels. Participants could  
193 choose and display any characters acquired on the learning screen. We also  
194 sent a reminder message with content after they had completed stages 1, 3,  
195 and 8 to encourage continued learning. We also implemented a feature that  
196 allowed participants to ask questions when unsure. These features were  
197 developed based on previous research, which demonstrated that rewards,  
198 personalization, reminders, and a supportive environment from others in I-CBT  
199 programs increased children's adherence [31].

200

201 **Table 1.** Contents by session

<b>Session</b>	<b>Content</b>
1	Understanding of four basic feelings
2	Monitoring feelings of anxiety and setting goals
3	Body reactions and relaxation
4	Anxiety level stages and stair step exposure
5	Anxiety cognition model
6	Identify cognitive distortions and coping with rumination

- 7 Cognitive restructuring when anxious
- 8 Assertiveness skills to reduce social stress
- 9 Review and summary

202

The screenshot shows a learning home screen for a program titled "勇者の旗" (The Hero's Banner). The interface includes a top navigation bar with a "ログアウト" (Logout) button and a "Reminder Message" section. The main area features a "しつもんする" (Ask Questions) button, a "自主トレをやってみよう!" (Let's try independent training!) banner, and a large map showing a path through nine stages (プロローグ, ステージ1-9) with "クリア!" (Clear!) banners. On the right, there are three panels: "旗の仲間" (Hero's Companion) displaying a selected character, "集めたポイント" (Earned Points) showing 900 points, and "集めたアイテム / レベル7" (Earned Items / Reached Levels) showing various items. Below these is an "お知らせ" (Notice) section with a message about system issues and contact information for the project team.

Annotations on the left side of the screenshot include:

- To Ask Questions: points to the "しつもんする" button.
- To Homework: points to the "自主トレをやってみよう!" banner.
- Entrance to Learning Stages: points to the map area.

203

204 **Fig.1** Learning home screen and features.

205

206 **2.4. Procedure**

207 We sent an e-learning account for each participating parent and child to the  
208 parent's e-mail address. When the children first logged onto the website to  
209 begin learning, we reaffirmed their assent by displaying an assent document  
210 that stated that they wished to learn on their own initiative and could withdraw  
211 at any time. Parents and children responded to a questionnaire that comprised  
212 the evaluation indicators three times: before the learning began (Pre), at the  
213 end (Post), and three months later (FU: Follow-up). We designed the  
214 questionnaire to be integrated into the learning process so that it would be  
215 clear when to respond. The first video was available after children had  
216 responded to the pre-study questionnaire. Conversely, we sent an e-mail to the  
217 parents when they had to respond to the questionnaire based on their  
218 children's learning progress. In addition, we set up the system so that parents  
219 could not only respond to the questionnaire, but also view the class videos so  
220 that they could see what their children would be learning. During the study  
221 period, we checked on the children's progress approximately once a week. If  
222 there was no access for >10 days, we sent an e-mail to the parents to confirm  
223 that they were still interested in participating.

224

## 225 **2.5. Measurements**

226 The primary outcome was the dropout rate. We evaluated whether children  
227 completed the program even in its e-learning version. We also comprehensively  
228 evaluated its feasibility, which included the results of satisfaction  
229 questionnaires rated on a 4-point scale and learning scores as secondary  
230 outcomes. In addition, psychological scale scores were also used as secondary  
231 outcomes. We cannot discuss the effect of the intervention as this was a single-  
232 arm trial. However, we considered how anxiety and other scores changed over  
233 the study period as an essential feasibility component.

234

### 235 **2.5.1. Spence Children's Anxiety Scale (SCAS)**

236 The SCAS assessed the severity of anxiety disorders in children [32], and the  
237 validity of the Japanese version has been demonstrated [33]. Since parental  
238 ratings were also helpful in assessing children's anxiety [34], we used both, the  
239 scales that children answered themselves (SCAS-C) and those that parents  
240 answered regarding their children (SCAS-P) [35]. Previous studies confirmed  
241 that classes with "Journey of the Brave" reduced the mean scores on the SCAS-  
242 C [16,19,30]. The SCAS-P was also used in studies during the program's early  
243 development and found significant reductions [15].

244

### 245 **2.5.2 Emotion-Regulation Skills Questionnaire (ERSQ)**

246 The ERSQ is the English version [36] of the Selbsteinschätzung Emotionaler  
247 Kompetenzen (SEK-27) [37]. The Japanese version demonstrated reliability and  
248 validity in a previous study [38]. Hence, we used this scale as a secondary  
249 outcome, with supplementary explanations for difficult words for elementary  
250 school children to observe the multi-dimensional changes before and after e-  
251 learning.

252

### 253 **2.5.3 Strengths and Difficulties Questionnaire (SDQ)**

254 The SDQ comprised 25 items on five subscales that assessed children's  
255 emotional symptoms, conduct problems, hyperactivity/inattention, peer  
256 relationship problems, and prosocial behavior [39]. Reliability and validity of  
257 the Japanese version, wherein parents responded regarding their children's  
258 anxiety, have been demonstrated [40]. The Total Difficulties Score (TDS), sum  
259 of the scores without the prosocial behavior subscale, had a maximum score of  
260 40. A score of >13 and >16 were considered "some need" and "high need,"  
261 respectively. We used the TDS to observe the multi-dimensional changes in the  
262 child as perceived by the parents before and after the e-learning program.



263

## 264 **2.6. Analysis**

265 The dropout rate was calculated as the percentage of children who started the  
266 program and withdrew during the 6-month study period. We did not consider  
267 those who did not complete the program during the study period as they could  
268 continue it. We confirmed their intention to continue each time through the  
269 parents if there was no access for <10 days. We obtained descriptive statistics  
270 from participants regarding satisfaction and from various learning records  
271 (e.g., checking test scores and number of homework assignments submitted).  
272 We analyzed continuous variables recording changes in psychological scale  
273 scores from Pre to FU via a repeated measures analysis of variance (ANOVA).  
274 Since the study purpose was to evaluate feasibility, it was also valuable to infer  
275 the type of children it would be more effective for and obtain findings that will  
276 contribute to future improvements. Therefore, we also compared two groups  
277 divided according to differences in psychological scale scores at the Pre time  
278 point. IBM SPSS Statistics version 28 was used for analysis.

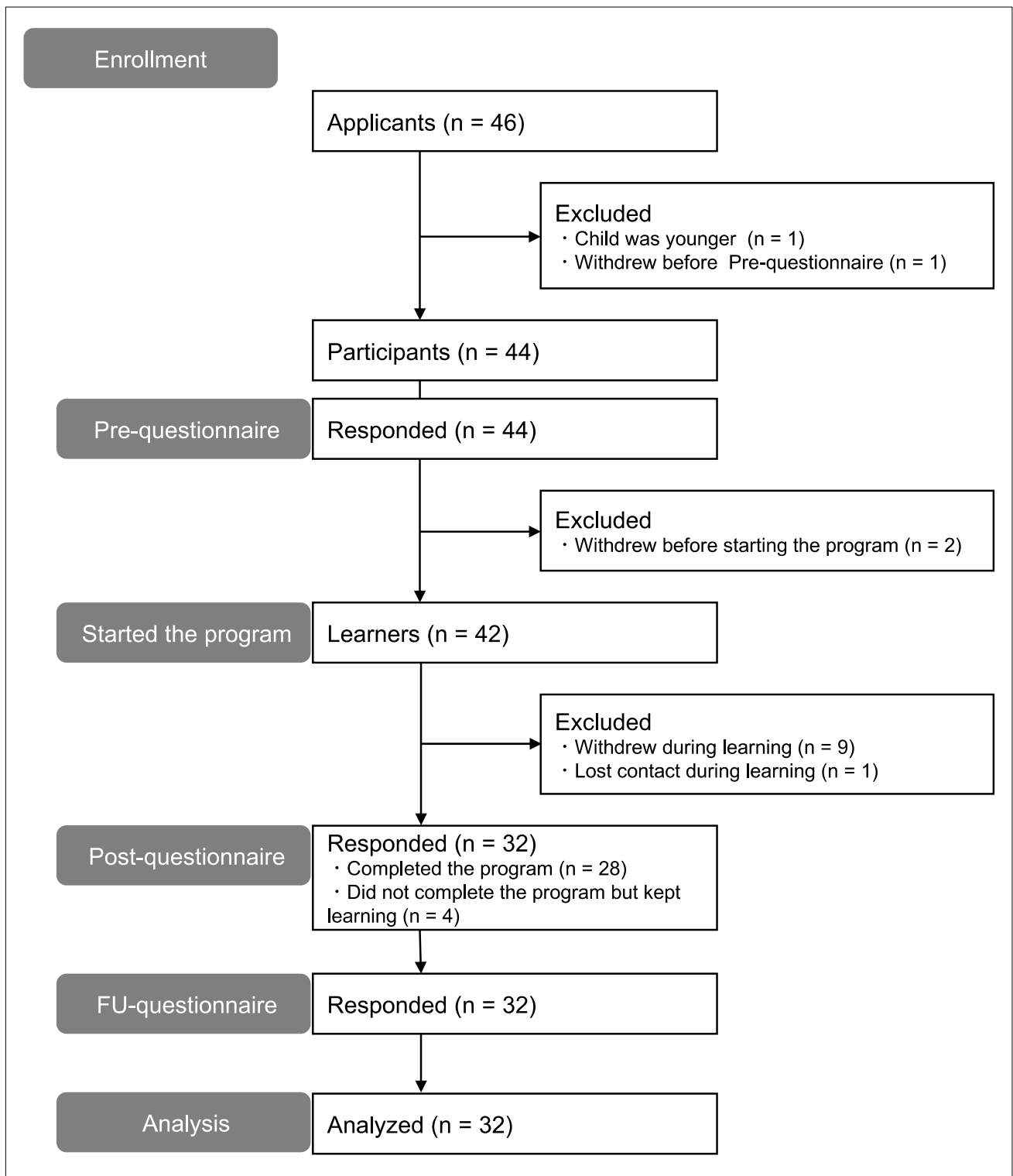
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## 281 **3. Results**

### 282 **3.1. Dropout Rate**

283 Of the 46 parents and their children who agreed to participate, we excluded  
284 two pairs as one child was younger than the target grades and another  
285 withdrew before the Pre-questionnaire. Therefore, 44 pairs participated (Fig.2,  
286 Table 2). Of these, four were single-mother families. Majority (19 (43.2%)) had  
287 a household income of >9 million yen (\$60,000). Furthermore, 34 (77.3%)  
288 fathers and 31 (70.5%) mothers had completed university or graduate school.  
289 Parents' average age was 44.4 years (38-52 years), of whom only two (4.5%)  
290 were fathers and 42 (95.5%) were mothers. Since two children responded to  
291 the Pre-questionnaire yet withdrew without starting the e-learning program, 42  
292 children, 29 (13 boys and 16 girls) and 13 (six boys and seven girls) in the fifth  
293 and sixth grades, respectively, actually started the study. Of these, 9 dropped  
294 out during their learning while one lost contact (dropout rate of 23.8%). Of the  
295 remaining 32 children, 28 completed the entire program, and the remaining  
296 four continued learning throughout the period and completed at least five or  
297 more stages (one completed five stages, one completed seven stages, and two  
298 completed eight stages). All 32 pairs also completed the Post- and FU  
299 questionnaires.



300

301 **Fig.2** Flow-chart displaying the number of parent-child pairs at each time point  
 302 and sample count.

303

304 **Table 2.** Participants' demographic data

		<b>Participants (n = 44)</b>
<b>Children's Information</b>		
<b>Sex</b>	Female	25 (56.8%)
	Male	19 (43.2%)
<b>Grade</b>	5th	30 (68.2%)
	6th	14 (31.8%)
<b>Reports from Parents</b>		
<b>Respondent</b>	Father	2 (4.5%)
	Mother	42 (95.5%)
<b>Average Age of Respondents</b>		44.4 (38-52)
<b>Family Composition</b>	Parents and child	40 (90.9%)
	Fatherless family	4 (9.1%)
<b>Household Incomes</b>	<3 million yen	2 (4.5%)
	3–6 million yen	12 (27.3%)
	6–9 million yen	11 (25.0%)
	>9 million yen	19 (43.2%)
<b>Father's Final Education</b>	Junior high school	1 (2.3%)
	High school	4 (9.1%)
	Vocational schools, junior colleges, etc.	5 (11.4%)
	University or graduate school	34 (77.3%)
<b>Mother's Final Education</b>	Junior high school	0 (0%)
	High school	6 (13.6%)
	Vocational schools, junior colleges, etc.	7 (15.9%)
	University or graduate school	31 (70.5%)

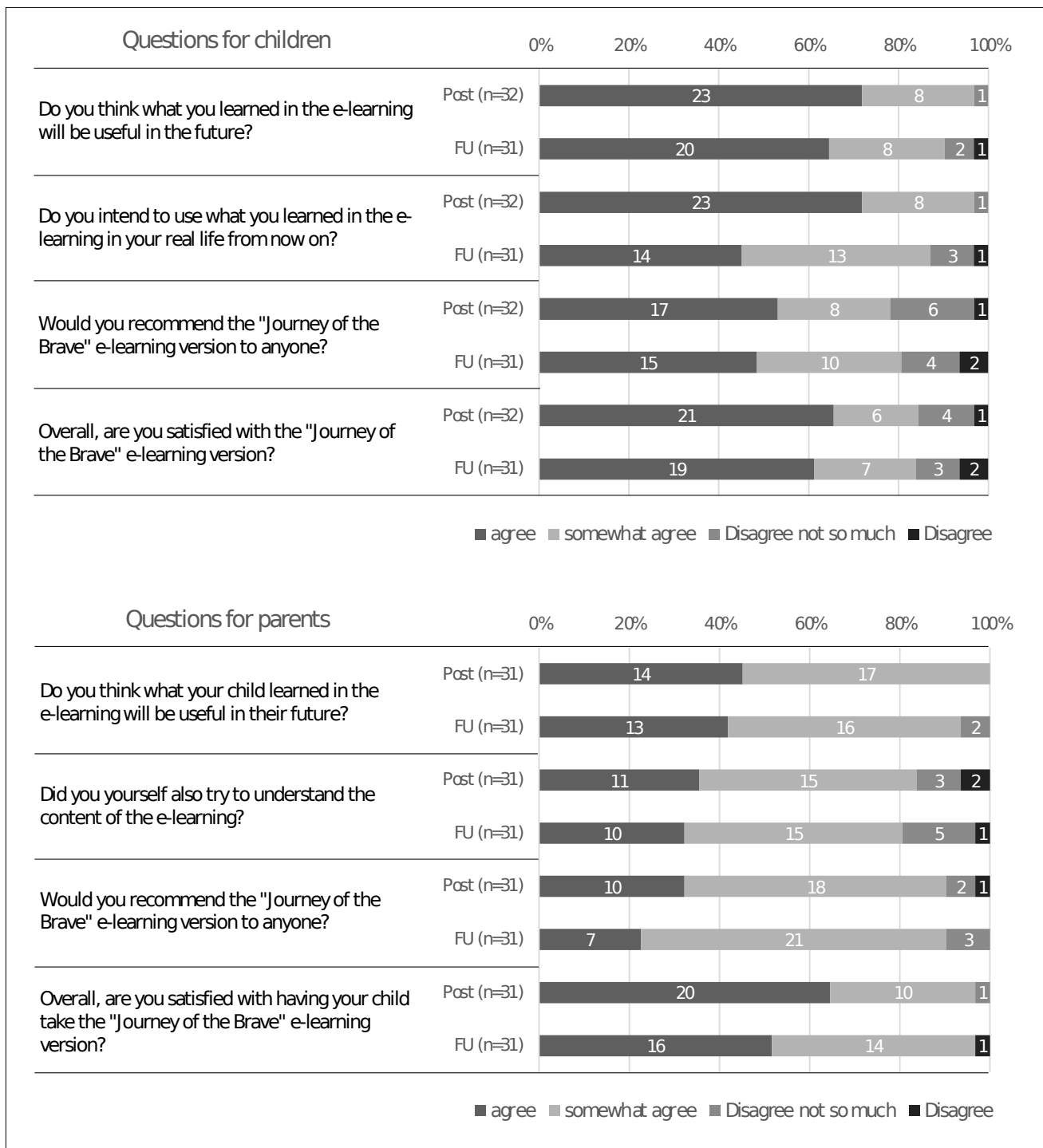
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306 **3.2. Satisfaction and Learning Records**

307 Fig 3 presents the details of the Post and FU questionnaire responses  
 308 regarding satisfaction. In total, 27 children (27/32, 84.4%) and 30 parents

309 (30/31, 96.8%), and 26 children (26/31, 83.9%) and 30 parents (30/31, 96.8%)  
310 answered “agree” or “somewhat agree” to the overall satisfaction question in  
311 Post and in FU, respectively. The 28 children who completed all stages took an  
312 average of 13.6 weeks for completion (measured from Stage 1 completion  
313 owing to different lengths of time between questionnaire responses and  
314 starting Stage 1). The average score of the 29 children who answered the  
315 comprehension test (correct/incorrect questions) on all the content learned,  
316 which was provided in the last stage (Stage 9), was 14.6 out of 16 points (11-  
317 16, SD=1.21). Conversely, the average number of times they submitted their  
318 homework was 8.6 times (of 15). Furthermore, there was a wide variation in  
319 their commitment to homework from 0-15 times (SD=6.28).

320



321

322 **Fig.3** Results of the questionnaire responses regarding satisfaction (Post and

323 FU).

324

325 **3.3. Changes in Psychological scales**

326 Table 3 presents the mean scores and standard deviations for each  
327 psychological scale from Pre to FU and results from repeated measures  
328 ANOVA. The 32 pairs who continued the program were analyzed. Data from  
329 children with missing items or responses were excluded. The mean SCAS-C  
330 score decreased by 4.37 points from Pre to FU (from 25.63 to 21.26); however,  
331 there was no significant difference between the three time points ( $p=0.08$ )  
332 (Fig.4). Conversely, the mean SCAS-P score decreased by 5.03 points (from  
333 17.69 to 12.66), which indicated a significant difference between Pre and FU  
334 ( $p=0.014$ , 95%CI= (-9.22, -0.84)) and Post and FU ( $p=0.004$ , 95%CI= (-7.50, -  
335 1.25)), respectively (Fig.5). The mean ERSQ score increased by 9.24 points  
336 (63.45 to 72.69), which indicated a significant difference between Pre and FU  
337 ( $p=0.045$ , 95%CI= (0.18,18.31)) (Fig.6). The mean SDQ-TDS score rated by  
338 parents decreased by 1.9 points from Pre to Post (from 11.59 to 9.69 points),  
339 which indicated a significant difference ( $p=0.025$ , 95%CI= (-3.62, -0.19)), and  
340 increased by 0.9 points from Post to FU. Thus, Pre and FU had no significant  
341 difference ( $p=0.67$ ) (Fig.7).

342

343 **Table 3.** Changes in the mean and standard deviation of each psychological  
344 scale.

<b>Scales</b>	<b>Pre, Mean (SD)</b>	<b>Post, Mean (SD)</b>	<b>FU, Mean (SD)</b>	<b>F</b>	<b>P</b>
SCAS-C (n=27)	25.63 (12.26)	25.15 (14.50)	21.26 (13.06)	2.65	0.080
SCAS-P (n=32)	17.69 (10.25)	17.03 (7.95)	12.66 (7.52)	7.18**	0.002
ERSQ (n=29)	63.45 (20.58)	68.38 (20.51)	72.69 (18.50)	3.39*	0.041
SDQ-TDS (n=32)	11.59 (5.80)	9.69 (5.87)	10.59 (5.40)	3.74*	0.029

345

<b>Comparison of the scores</b>			<b>Mean difference (SE)</b>	<b>P</b>	<b>95%CI of Mean difference</b>	
					<b>Lower limit</b>	<b>Upper limit</b>
SCAS-P (n=32)	Pre	Post	0.66 (1.41)	1.000	-2.91	4.22
		FU	5.03* (1.66)	0.014	0.84	9.22
	Post	FU	4.38** (1.24)	0.004	1.25	7.50
ERSQ (n=29)	Pre	Post	-4.93 (4.00)	0.685	-15.12	5.26
		FU	-9.24* (3.56)	0.04	-18.31	-0.18
	Post	FU	-4.31 (3.03)	0.50	-12.02	3.40
SDQ-TDS (n=32)	Pre	Post	1.91* (0.68)	0.025	0.19	3.62
		FU	1.00 (0.80)	0.665	-1.03	3.03
	Post	FU	-0.91 (0.60)	0.419	-2.42	0.61

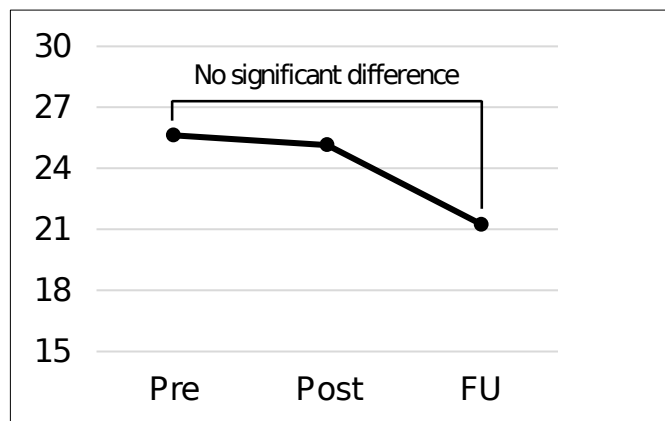
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SCAS-C/P, Spence Children's Anxiety Scale Child/Parent version; ERSQ, Emotion-Regulation Skills Questionnaire; SDQ-TDS, Strengths and Difficulties Questionnaire Total Difficulties Score.

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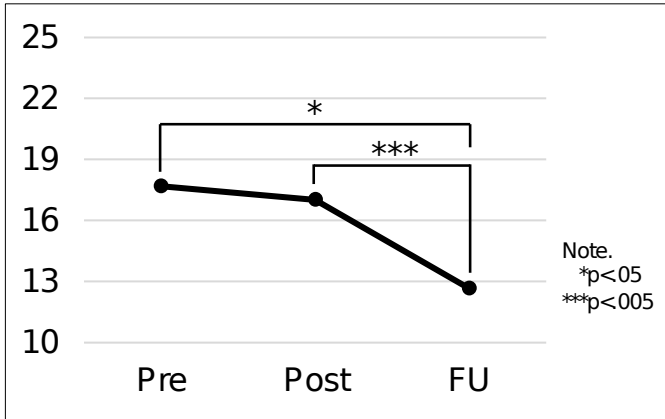


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351 **Fig.4** Change in the mean SCAS-C scores

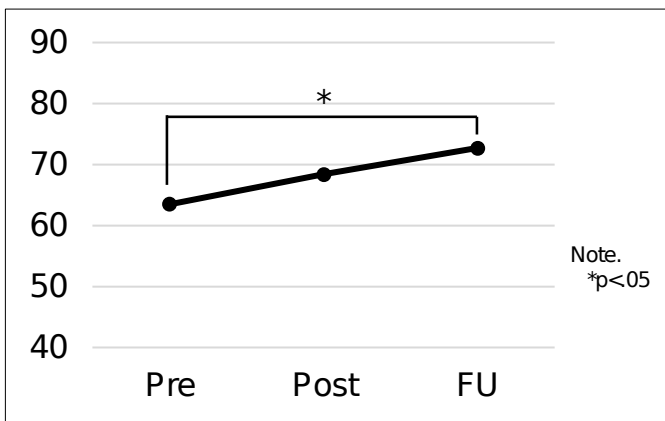
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353

354 **Fig.5** Change in the mean SCAS-P scores.

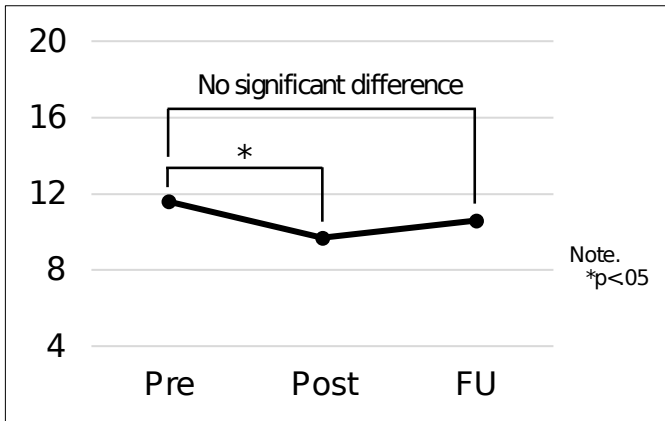
355



356

357 **Fig.6** Change in the mean ERSQ scores.

358



359  
 360 **Fig.7** Change in the mean SDQ-Total Difficulties scores.

361  
 362 **3.4. Subgroup Analysis by Differences in Pre-intervention Scores**

363 Previous research found that the high group (top 10% of pre-intervention  
 364 SCAS-C scores) showed a significant decrease in scores compared to the low  
 365 group [16]. In this study, four children (9.1%) with SCAS-C scores of 45 or  
 366 higher at Pre were considered a high group. However, two children and one  
 367 child dropped out before the learning began and at Stage 1, respectively.  
 368 Hence, subgroup analysis between high and low SCAS-C scores could not be  
 369 performed. Therefore, we created a subgroup based on the SDQ-TDS at the Pre  
 370 time point to evaluate differences in the SCAS-C and SCAS-P mean score  
 371 changes at the three time points in each group (Table 4). Interaction between  
 372 score changes and group for the SCAS-C was insignificant for the high and low  
 373 group with an SDQ-TDS score of >13 and <13, respectively ( $p=0.96$ ) (Fig.8).

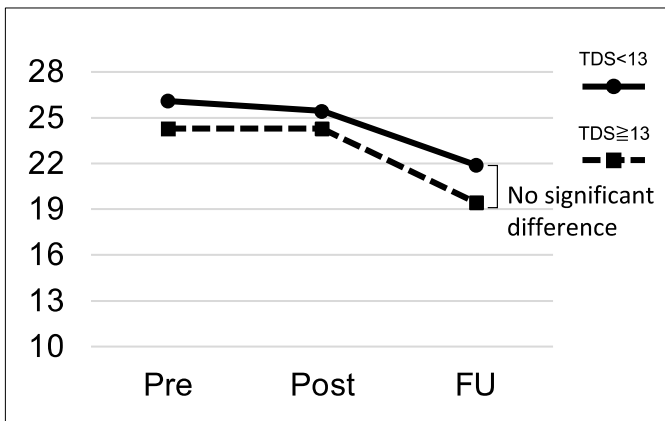
374 However, a significant interaction was observed between score changes and  
 375 group for the SCAS-P ( $F=3.73$ ,  $p=0.03$ ) (Fig.9).

376

377 **Table 4.** Within-subject effects of the SCAS and SDQ-TDS.

		Sum of Squares	df	Mean Square	F	P	Observed Power
SCAS-C	Time	264.68	2	132.34	2.18	0.124	0.43
	Time × TDS	4.43	2	2.21	0.04	0.964	0.06
	Error	3037.47	50	60.75			
SCAS-P	Time	572.84	2	286.42	9.35	<0.001	0.97
	Time × TDS	228.39	2	114.19	3.73	0.030	0.66
	Error	1838.18	60	30.64			

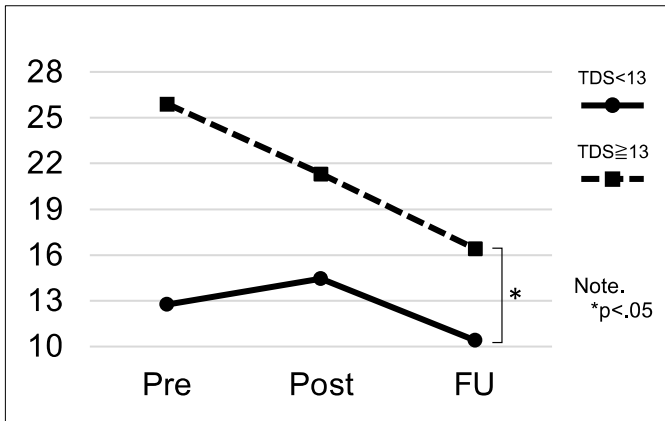
378



379

380 **Fig.8** Change in the mean SCAS-C scores in the high/low TDS groups.

381



382

383 **Fig.9** Change in the mean SCAS-P scores in the high/low TDS groups.

384

### 385 **3.5. Evaluation of E-learning Features**

386 In addition to satisfaction, the questionnaire also enquired ratings of the  
 387 various features on a scale from 1 to 10. Table 5 presents the average rating  
 388 scores for each of the e-learning features. The reward and personalization  
 389 features, which allowed users to obtain items and characters and choose which  
 390 characters to display, respectively, received relatively high evaluations.  
 391 Conversely, the homework feature, called “self-training,” received the lowest  
 392 evaluation.

393

394 **Table 5.** Evaluation of e-learning features

	Rating out of 10	
	Average score of children	Average score of parents
Earn points	7.7	7.7

Obtain items and characters	8.0	8.4
Choose characters by themselves	8.0	8.3
Can do “self-training”	6.6	6.7
Receive reminder messages	7.3	7.5
Ask questions	8.2	7.2

---

395

## 396 **4. Discussion**

### 397 **4.1 Feasibility**

398 We developed and evaluated the feasibility of an e-learning version of the

399 “Journey of the Brave” anxiety prevention program for children in Japan. The

400 dropout rate was 23.8%. Of the participants, 76.2% and 66.7% completed at

401 least five and all the stages, respectively. Furthermore, 83.9% of children and

402 96.8% of parents responded positively to the overall satisfaction level at FU.

403 No other I-CBT study used an e-learning format where children with no

404 apparent symptoms or problems took a universal anxiety prevention CBT

405 program on an individual basis. Therefore, we cannot make comparisons.

406 However, a study on university students with mild-to-moderate depression or

407 anxiety symptoms (“ICare Prevent”) reported that 54.2% and 39.6% completed

408 four or more and all seven sessions, respectively [41]. Furthermore, a meta-

409 analysis of 64 trials that examined the effectiveness of I-CBT for patients with

410 depression or anxiety disorders found a median adherence and satisfaction

411 rate of 66% and 86%, respectively [25]. Compared to these studies, many  
412 parents and children viewed this program positively, despite the inclusion of  
413 participants who did not experience anxiety issues.

414 Regarding changes in psychological scale scores, a non-significant decrease  
415 was observed in the mean score for the SCAS-C; however, a significant  
416 decrease was observed for the SCAS-P from Pre to FU. These results were  
417 similar to those of a previous study [15]. It was possible that an e-learning  
418 version could also significantly reduce the mean SCAS-C score if a larger  
419 sample was included, similar to the original program. We also observed a  
420 significant increase in the mean ERSQ scores from Pre to FU, which indicated  
421 that children's emotion regulation skills increased before and after the  
422 program's implementation. The e-learning program could have promoted  
423 children's emotion regulation skills. This was a novel finding. Emotion  
424 regulation skills could be a predictor of prevention effectiveness in anxiety  
425 prevention programs targeting non-clinical groups. Previous studies reported  
426 that emotion regulation was associated with the onset and maintenance of  
427 anxiety disorders [42]. These results supported the feasibility of the e-learning  
428 version based on its acceptability regarding low dropout rates and high

429 satisfaction levels, as well as the expected effects of reduced anxiety and  
430 improved emotional regulation skills.

431 The mean SDQ-TDS, which indicated difficulties stemming from children's  
432 emotional and behavioral problems, showed a significant decrease from Pre to  
433 Post. Conversely, the decrease was not maintained in FU. This indicated that  
434 the change was not sustained, at least regarding the child's specific problems  
435 observable from a parent's perspective. It was possible that since this program  
436 was essentially an anxiety prevention education program, its other problem-  
437 solving effects could have been limited. Hence, continuous verification is  
438 required to make a more accurate reference.

439 Most parents and children in the high SCAS-C score group dropped out without  
440 learning or dropped out early. Hence, we could not conduct subgroup analyses  
441 with high and low anxiety scores. We hypothesized that the e-learning version  
442 would also have a more significant effect on children with high anxiety.

443 However, the population most likely to show a significant effect may not have  
444 accepted e-learning. Early dropouts may have resulted from an accidental  
445 outcome due to the small sample size or that highly anxious children felt  
446 burdened by the individualized learning experience. Clarifying the reasons they  
447 dropped out before learning and improving the e-learning to be more

448 acceptable may deliver its effect to the high score group. The e-learning  
449 version may also have a pronounced anxiety reduction effect when  
450 implemented in schools, as in previous studies. Subgroup analysis by SDQ-TDS  
451 showed that the group of children considered to have support needs decreased  
452 significantly in mean scores on parent-rated anxiety (SCAS-P) from Pre to FU.  
453 This suggests that children with more difficulties in their daily lives could  
454 benefit from the program. However, there was no significant difference in the  
455 SCAS-C change. Hence, further examination with a larger sample size is  
456 required to make a more accurate reference.

457

## 458 **4.2. Feature Improvements**

459 These findings indicate that the design of a series of features based on rewards  
460 and personalization, such as earning points and level progression through  
461 learning, adding items and characters via progression, and selecting favorite  
462 characters to display, were highly rated. Conversely, the features for receiving  
463 messages were rated less highly. Children had to click several times to reach  
464 the dedicated message box to see the messages. In addition, a researcher had  
465 to manually send the messages as the system could not automatically send  
466 prepared messages owing to system limitations. We do not want teachers to be



467 burdened with sending messages, especially when conducting e-learning in a  
468 school environment. Hence, ensuring that a message is automatically displayed  
469 when each stage is completed is a future requirement. We were also  
470 disappointed that the homework feature, an essential component, was not  
471 rated very highly and polarized the children into two groups: those who worked  
472 on very little and those who worked on almost everything. However, no  
473 previous study examined the extent to which children engaged in the  
474 homework associated with the program. These results suggest that considering  
475 ways to ensure that children wanted to continue doing homework could  
476 improve the quality of the program.

477

### 478 **4.3. Limitation**

479 This study has several limitations. First, the sampling issue. The participants  
480 might have been quite different from the classroom population where the  
481 program would be implemented as they were parents and children who  
482 willingly took the program. Furthermore, although the largest number of  
483 participants were from families with household incomes exceeding 9 million  
484 yen, the average annual income of households with children in Japan was 7.85  
485 million yen [43]. Although >70% of both parents who participated had a

486 university or graduate school education, only 37.6% of men and 22.7% of  
487 women in their 40s in Japan had a university or graduate school education [44].  
488 Hence, children who participated were raised by parents with high incomes  
489 and educational backgrounds, which may have influenced the children's  
490 lifestyle and attitudes toward e-learning. Second, we cannot inherently address  
491 the contribution of e-learning to changes in scores on psychological scales,  
492 including the anxiety preventive effect, as this was a single-arm study with no  
493 control group. We cannot assert that the positive changes were caused by e-  
494 learning, although we found significant positive changes in the SCAS-P and in  
495 ERSQ scores between Pre and FU. Furthermore, the reliability and validity of  
496 the Japanese version of the ERSQ has yet to be confirmed among elementary  
497 school students. However, we found no reason to doubt the feasibility of the e-  
498 learning version as we detected no adverse changes in any psychological  
499 scales, such as an increase in the mean anxiety score after the intervention.

500

## 501 **5. Conclusion**

502 The study evaluated the feasibility of a newly developed e-learning version of  
503 the “Journey of the Brave” CBT-based anxiety prevention program, with 44  
504 parent-child pairs. The study observed low dropout rates and high satisfaction

505 from parents and children. We confirmed a specific feasibility, as it did not  
506 show any results contrary to expectations regarding reducing anxiety or  
507 improving emotional regulation skills. Verifying whether the e-learning version  
508 can show preventive effects of anxiety on the originally intended target  
509 population via comparison with a control group in a school environment is  
510 necessary.

511

## 512 **Abbreviations**

513 CBT: Cognitive behavioral therapy; I-CBT: Internet-based cognitive behavioral  
514 therapy; SCAS: Spence Children's Anxiety Scale; ERSQ: Emotion-Regulation  
515 Skills Questionnaire; SDQ: Strengths and Difficulties Questionnaire; MEXT:  
516 Ministry of Education, Culture, Sports, Science and Technology; ANOVA:  
517 Analysis of variance.

518

## 519 **Declarations**

### 520 **Ethics approval and consent to participate**

521 The protocol was approved by the Ethics Review Committee of Chiba  
522 University School of Medicine in accordance with the Ethical Guidelines for  
523 Medical and Health Research Involving Human Subjects as well as the

524 Declaration of Helsinki. Informed consent forms were available on the web  
525 which were filled out by the parents. A plain language children's assent  
526 document was also available on the web to ensure that both the parents and  
527 children were willing to participate.

528

### 529 **Consent for publication**

530 Not applicable.

531

### 532 **Availability of data and materials**

533 The datasets used and analyzed during the current study are available from the  
534 corresponding author on reasonable request.

535

### 536 **Competing interests**

537 The authors declare that they have no competing interests.

538

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543 “Support for Pioneering Research Initiated by the Next Generation” program  
544 by the Japan Science and Technology Agency.

545

#### 546 **Authors' contributions**

547 SO contributed to all aspects of the study design, e-learning development, data  
548 collection, statistical analysis, and manuscript preparation. YU oversaw the  
549 study design and e-learning development and provided advice in manuscript  
550 preparation. KF made major contributions to the study design and statistical  
551 analysis. TK contributed to the study design. SI contributed to data collection  
552 and manuscript revision. ES reviewed the study design and the manuscript. All  
553 authors read and approved the final manuscript.

554

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557

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728 **Further reading**

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