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Lesaffre, Lise; Kuhn, Gustav; Jopp, Daniela; Mantzouranis, Gregory; Ndéyane, Cécile; Rochat, Déborah and Mohr, Christine. 2021. Talking to the dead in the classroom. How a supposedly psychic event impacts beliefs and feelings. *Psychological Reports*, 124(6), pp. 2427-2452. ISSN 0033-2941 [Article]

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1           **Talking to the dead in the classroom. How a supposedly**  
2           **psychic event impacts beliefs and feelings**

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4  
5 Lise Lesaffre<sup>1\*</sup>, Gustav Kuhn<sup>2</sup>, Daniela Jopp<sup>1,3</sup>, Gregory Mantzouranis<sup>1,4</sup>, Cécile Ndéyane  
6 Diouf<sup>1</sup>, Déborah Rochat<sup>5</sup>, Christine Mohr<sup>1</sup>

7  
8 <sup>1</sup> Institute of Psychology, Social and Political Sciences, University of Lausanne, Switzerland.

9 <sup>2</sup> Psychology Department, Goldsmiths University of London, London, UK.

10 <sup>3</sup> Swiss Centre of Competence in Research LIVES “Overcoming vulnerability: Life course perspectives”.

11 <sup>4</sup> Unit of the University Department of Child and Adolescent Psychiatry (SUPEA), CHUV, Switzerland.

12 <sup>5</sup> Psychology Department, Faculty of Arts and Humanities, University of Fribourg, Switzerland.  
13

14           \*Correspondence:

15           Lesaffre Lise

16           Institute of Psychology, Social and Political Sciences

17           University of Lausanne, Switzerland.

18           [lise.lesaffre@unil.ch](mailto:lise.lesaffre@unil.ch)  
19

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21

22 **Abstract**

23 Paranormal beliefs (PBs) are common in adults. There are numerous psychological  
24 correlates of PBs and associated theories, yet, we do not know whether such correlates  
25 reinforce or result from PBs. To understand causality, we developed an experimental  
26 design in which participants experience supposedly paranormal events. Thus, we can test  
27 an event's impact on PBs and PB-associated correlates (Mohr, Lesaffre, & Kuhn, 2018).  
28 Here, 419 naïve students saw a performer making contact with a confederate's deceased  
29 kin. We tested participants' opinions and feelings about this performance, and whether  
30 these predicted how participants explain the performance. We assessed participants' PBs  
31 and repetition avoidance (PB related cognitive correlate) before and after the  
32 performance. Afterwards, participants rated explanations of the event and described their  
33 opinions and feelings (open-ended question). Overall, 65% of participants reported  
34 having witnessed a genuine paranormal event. The open-ended question revealed distinct  
35 opinion and affect groups, with reactions commonly characterized by doubt and mixed  
36 feelings. Importantly, paranormal explanations were more likely when participants  
37 reported their feelings than when not reported. Beyond these results, we replicated that  
38 1) higher pre-existing PBs were associated with more psychic explanations (confirmation  
39 bias), and 2) PBs and repetition avoidance did not change from before to after the  
40 performance. Yet, PBs reminiscent of the actual performance (spiritualism) increased.

41 Results showed that young adults easily endorse PBs and paranormal explanations for  
42 events, and that their affective reactions matter. Future studies should use participants'  
43 subjective experiences to target PBs in causal designs (e.g., adding control conditions).

44 **Keywords**

45 belief; supernatural; magic routine; cognition; affect

46

47 **Introduction**

48 Paranormal beliefs (PBs) are common in the Western world, whether assessed in children  
49 or adults (Hutson, 2012; Knittel & Schetsche, 2012; Moore, 2005; Rice, 2003). Broadly  
50 speaking, PBs include superstitious, paranormal, extra-terrestrial, religious, spiritual, and  
51 supernatural beliefs (Lindeman & Svedholm, 2012). Developmental studies have shown  
52 that PBs are dominant in childhood when children often mix up fantasy and reality  
53 (Subbotsky, 2004a; Woolley, 1997). Various well-known authors placed the abundance  
54 of PBs to what Piaget coined as the preoperational stage of childhood (Freud, 1950;  
55 Piaget, 1928, 1929; Werner, 1948). Accordingly, PBs should disappear, or at least  
56 diminish, as the child becomes older. The critical period for PBs to disappear – making  
57 room for critical and scientific thinking – should occur around six years of age (Piaget,  
58 1929; Subbotsky, 2000, 2004b; Woolley, 1997). Yet, these assumptions do not match  
59 reality, because PBs are frequent in adulthood (Nemeroff & Rozin, 2000; Subbotsky,  
60 2004b). We developed an experimental design to help understand the causal mechanisms  
61 that explain the persistence and/or formation of PBs in adulthood (see Mohr, Lesaffre and  
62 Kuhn, 2018, for the theoretical rationale). In this design, participants witness a supposedly  
63 paranormal event. We assessed whether the variables of interest changed from before to  
64 after the event; and we also measured psychological variables that might predict whether  
65 people explain the event in paranormal terms.

66 Previous studies have shown that PBs vary depending on situation and context.  
67 For instance, adults provided more paranormal explanations when situations were  
68 stressful (Keinan, 1994) and/or uncontrollable (Langer, 1975). Also, others have shown  
69 that verbal suggestions could increase the extent to which participants reported  
70 paranormal experiences when witnessing a “séance” (Wiseman, Greening, & Smith,  
71 2003) or psychokinetic phenomena (i.e. alleged psychic ability allowing a person to  
72 influence a physical object without physical interaction; Wiseman & Greening, 2005).  
73 Moreover, increases in PBs or PB-related behaviors have been observed when the denial  
74 of the paranormal might have negative consequences (Subbotsky & Quinteros, 2002).  
75 Finally, participants may explicitly state that they do not believe in the paranormal, but  
76 their behavior suggests that they implicitly consider the possibility of paranormal events  
77 (see also Nemeroff & Rozin, 1994; Subbotsky & Quinteros, 2002). Such studies indicate  
78 that (1) situations and context influence the extent to which PBs are acknowledged, and  
79 (2) a range of different measurements might be required to elicit PBs, for example,  
80 explicitly asking about beliefs (PBs), but also testing PB-related behavior.

81 Standardized PB questionnaires allow us to measure people’s explicit PBs (Prike,  
82 Arnold, & Williamson, 2017; Thalbourne & Delin, 1993). Likewise, we can assess PB-  
83 related behavior with cognitive measures that have previously been associated with  
84 enhanced PBs. Examples of such measures include (1) tasks that show a tendency to  
85 easily associate things or events (Bressan, 2002; Rogers, Fisk, & Wiltshire, 2011; Rogers,

86 Qualter, & Wood, 2016), (2) the propensity to see meaningful patterns in random noise  
87 (Blackmore & Moore, 1994; Brugger et al., 1993; Riecki, Lindeman, Aleneff, Halme, &  
88 Nuortimo, 2013), (3) attenuated reasoning abilities (Denovan, Dagnall, Drinkwater, &  
89 Parker, 2018; Lawrence & Peters, 2004; Lindeman & Svedholm-Häkkinen, 2016), and  
90 (4) repetition avoidance (Brugger, Landis, & Regard, 1990). Brugger et al. (1990)  
91 assessed repetition avoidance by asking participants to repeatedly imagine throwing a  
92 dice and to report the number they imagined on top of the dice (mental dice task).  
93 Participants high, as compared to low, in PBs showed a stronger repetition avoidance  
94 (i.e., they avoided stating sequences of identical numbers). The authors argued that this  
95 repetition avoidance represents participants' propensity to underestimate chance, and thus  
96 to see meaning in randomly occurring events.

97         This mental dice task has been used to assess PB-related behavior in studies that  
98 have used staged paranormal demonstrations to investigate the causal link between  
99 cognitive biases and paranormal beliefs (Lesaffre, Kuhn, Abu-Akel, Rochat, & Mohr,  
100 2018; Mohr, Koutrakis, & Kuhn, 2015). In these classroom studies, participants saw a  
101 performance of paranormal nature (see also Benassi, Singer, & Reynodls, 1980; Mohr et  
102 al., 2018), and the researchers assessed individuals' PBs (Tobacyk, 2004) and repetition  
103 avoidance using a mental dice task (MDT; Brugger et al., 1990) before and after the  
104 performance. Participants were also asked to indicate the extent to which they explained  
105 the experience in psychic, conjuring, and religious terms. These studies showed that pre-

106 existing PBs (assessed before the performance) correlated with more pronounced psychic  
107 event explanations after the performance (Mohr & Kuhn, 2020). However, these previous  
108 studies used relatively simple conjuring tricks (Benassi et al., 1980), which resulted in  
109 relatively low levels of paranormal explanations. We therefore replaced these simple  
110 tricks with a routine that had a stronger paranormal nature: a medium making contact  
111 with a confederate's deceased kin.

112         When using this stronger paranormal routine, psychic and conjuring explanations  
113 were prevalent of comparable frequency (studies 2 and 3 in Lesaffre et al., 2018).  
114 However, these studies did not report significant increases in either PBs or repetition  
115 avoidance from before to after the performance. However, they did reveal that many  
116 participants seemed confused by the performance and simultaneously endorsed psychic  
117 and conjuring explanations. Lesaffre et al. (2018) additionally noted that the performance  
118 elicited strong affective responses. In light of these latter observations, the current study  
119 focused on participants' confusion and affect. We examined whether these factors  
120 correlate with how participants experience supposedly paranormal events. For affectivity,  
121 we have some indication for its importance on beliefs (Frijda, Manstead, and Bem (2000).  
122 For instance, PBs provided explanations for the unknown (Heine, Proulx, & Vohs, 2006;  
123 Wyer & Albarracín, 2005), a sense of control (Boden & Gross, 2013), or helped to  
124 manage one's stress (Keinan, 2002; Mascaro & Rosen, 2006; Tuck, Alleyne, &  
125 Thinganjana, 2006).

126           Our students experienced a performer in the classroom who allegedly contacted  
127 the deceased kin of a confederate (see Lesaffre et al., 2018; Mohr et al., 2015). Before  
128 and after the performance, we assessed PBs using a standardized PB questionnaire  
129 (Tobacyk, 2004) and repetition avoidance using the mental dice task (Brugger et al.,  
130 1990). After the performance, participants indicated the extent to which they explained  
131 the performance in psychic, conjuring, and religious terms (see also Lesaffre et al., 2018;  
132 Mohr et al., 2015). Most importantly, we asked participants to report on their opinions  
133 and feelings about the performance. We used an open-ended question to assess  
134 participants' spontaneous accounts. We used "open coding" (Glaser & Strauss, 1968) as  
135 well as "clustering" or "theme identification" (Miles & Huberman, 1994) to determine  
136 recurrent themes. Having these themes, we could test which opinions and feelings were  
137 associated with participants' endorsement of paranormal explanations. In addition, we  
138 expected, first, to replicate that pre-existing PBs correlate with more psychic explanations  
139 after the performance (Lesaffre et al., 2018; Mohr et al., 2015). Second, we expected no  
140 change in PBs or repetition avoidance (Lesaffre et al., 2018; Mohr et al., 2015), but PBs  
141 reminiscent of the performance (i.e., spiritualism subscale; R-PBS spiritualism scores) to  
142 increase from before to after the performance. The later prediction was based on the  
143 observation that people endorsed particular beliefs after having experienced an event that  
144 most closely resembled these beliefs (French & Wilson, 2007; Glicksohn, 1990; Irwin,  
145 Dagnall, & Drinkwater, 2013; Lan, Mohr, Hu, & Kuhn, 2018).

146 **Materials and methods**

147 **Participants**

148 We recruited 419 first-year psychology undergraduate students (291 females) at a  
149 University in the French speaking part of Switzerland. Their mean age (in years) was 20.5  
150 (SD = 3.07; range 18-47). Participants were recruited in the classroom after an  
151 introductory social psychology lecture. The experiment was conducted directly after the  
152 recruitment in the same classroom.

153 Swiss Law does not require ethical confirmation for this type of study. Yet, as  
154 detailed in the general procedure section, the current study was performed in accordance  
155 with the ethical standards described in the 1964 Helsinki declaration and its later  
156 amendments or comparable ethical standards (World Medical Association, 2013).

157 **Self-report Measures**

158 **Paranormal belief questionnaire**

159 *Revised Paranormal Belief Scale (R-PBS; Tobacyk, 2004)*. We used its validated  
160 French version (Bouvet, Djeriouat, Goutaudier, Py, & Chabrol, 2014). This 26-item self-  
161 report questionnaire consists of seven subscales including Traditional Religious Beliefs  
162 (e.g., “There is a heaven and hell”), Psi (“A person’s thoughts can influence the  
163 movement of a physical object”), Witchcraft (e.g., “Witches do exist”), Superstition (e.g.,  
164 “Black cats bring bad luck”), Spiritualism (e.g., “It is possible to communicate with the  
165 dead”), Extraordinary Life Forms (e.g., “The Loch Ness monster of Scotland exists”),

166 and Precognition (e.g., “The horoscope accurately tells a person’s future”). Participants  
167 answered each item along a 7-point Likert scale ranging from 1 (strongly disagree) to 7  
168 (strongly agree). Accounting for one reversely coded item, the scores were averaged so  
169 that higher scores reflect greater PB. Regarding R-PBS psychometrics qualities, Tobacyk  
170 (2004) reported adequate validity and a satisfactory reliability. Drinkwater, Denovan,  
171 Dagnall, and Parker (2017) recently assessed R-PBS dimensionality and factorial  
172 structure. They found that the seven factors (as described above) as well as the global  
173 factor (R-PBS total) best explained the data. In the current study, we calculated the R-  
174 PBS total scores and the R-PBS spiritualism scores. Cronbach alpha reliability for the R-  
175 PBS total scores was excellent for both pre ( $\alpha = .89$ ) and post ( $\alpha = .91$ ) measures, and  
176 acceptable to good for R-PBS spiritualism scores pre ( $\alpha = .74$ ) and post ( $\alpha = .81$ )  
177 measures. These results are close to what Drinkwater et al. (2017) found in their study,  
178 for R-PBS global score ( $\alpha = .93$ ) and Spiritualism ( $\alpha = .83$ ), respectively.

#### 179 **Event explanation scores**

180 We asked participants whether the performance was accomplished through (1)  
181 paranormal, psychic, or supernatural powers (psychic explanation), (2) ordinary magic  
182 trickery (conjurer explanation), or (3) religious miracles (religious explanation) using a  
183 7-point Likert scale [1 for strongly disagree to 7 for strongly agree; (Lesaffre et al., 2018;  
184 Mohr et al., 2015)].

#### 185 **Assessment of participants’ overall impression of the performance**

186 Participants were asked about their general impression of the performance using the  
187 following open question: "Please indicate your feelings and opinions about the  
188 performance you have just seen." Participants then freely formulated their answers.  
189 Answers were later coded for content (see qualitative data section).

190 **Repetition avoidance using the Mental dice task (Brugger et al., 1990).**

191 Participants received written and verbal instructions to imagine throwing a dice each time  
192 they heard a beep and to write down the number that they imagined being on top of the  
193 dice (66 trials). Computer-generated beeps were played 66 times at one second intervals,  
194 during which participants wrote down the imagined number. We calculated the number  
195 of first order repetitions (e.g. 1-1, 2-2, 3-3). If numbers were generated randomly, the  
196 number of repetitions would average 10.8 (page 461 in Brugger et al., 1990). While  
197 people in general produce less repetitions than expected by chance, this repetition  
198 avoidance is stronger in believers of the paranormal than in sceptics (Brugger et al.,  
199 1990).

200 **Magic Performance**

201 The performance closely resembled the performance described in Lesaffre et al. (2018;  
202 Study 2 and 3). To be as ambiguous as possible about the performer (avoiding the  
203 impression of an experienced stage magician or psychic), the performance accentuated  
204 the performer's and the confederate's discomfort of being on stage, non-professionalism,  
205 and affectivity. Specifically, a semi-professional magician (Gregory) performed the

206 event. Gregory is a member of the FISM (International Federation of Magical Society)  
207 club of Geneva ([www.lecmg.ch](http://www.lecmg.ch)). He specializes in mentalism. We did not use magic  
208 props, such as cards or coins. The performance consisted of two parts. First, the performer  
209 aimed to guess the color a volunteer had selected. The volunteer received a dice with  
210 colors on the dice's sides. Hidden from Gregory, the volunteer turned the dice so that the  
211 selected color was shown on top. Due to unexpected technical problems with the dice,  
212 this part of the performance was initiated, but not completed. Afterwards, the performer  
213 invited a confederate from the audience to join him. This female confederate was asked  
214 to think about one of her deceased close family members, in order to get in touch with  
215 him or her. The performer, after "having felt" a presence, started to "guess" details about  
216 the deceased person. Gregory reported more details about this person's life as the  
217 performance continued. These details were "almost accurate" (e.g., Gregory guessed that  
218 the family member's name was Michel, but it was actually Michael). As the performance  
219 continued, the confederate became increasingly emotional. The performer finished the  
220 performance by telling the young woman that her father loves her, that he was very proud  
221 of her, and that he would always look after her.

## 222 **Experimental Manipulation and General Procedure**

223 At the end of the introductory lecture on social psychology, the experimenter (LL) invited  
224 participants to partake in the experiment. The experiment was unrelated to the  
225 introductory lecture. Those who stayed for the experiment received only general

226 information concerning the procedure. Participants were then invited to sign a consent  
227 form. A professional camera team filmed the procedure for subsequent research and  
228 presentation purposes. We specified where students would have to sit if they wished to  
229 remain outside the reach of the camera during the experiment. After the students took  
230 their preferred seats, they were given a work booklet that contained the study material.  
231 They were invited to open the first page of the booklet where they received general study  
232 information that was concurrently given in oral form by the experimenter (LL). They  
233 were also instructed to refrain from communicating with fellow students throughout the  
234 experiment (see supplementary material for the detailed instructions). Immediately  
235 afterward, participants filled out the PB questionnaire (Tobacyk, 2004). Following this,  
236 they were asked to perform the mental dice task (MDT; Brugger et al., 1990). Once  
237 completed, we gave additional oral information and instructions about the upcoming  
238 performance (see supplementary material for details on this oral information). After the  
239 performance, the students were asked to perform the mental dice task again (Brugger et  
240 al., 1990). Subsequently, they were asked to complete the event explanation questions,  
241 the PB questionnaire (Tobacyk, 2004), and finally the open question. After completing  
242 the experiment, participants received a short debrief in writing, and a full debrief in  
243 person, one week later.

## 244 **Data Treatment**

245 Of the original 418 participants, 390 participants were retained for subsequent analysis.  
246 Of those participants discarded, 11 booklets were empty, three participants did not  
247 provide signed consent, and 13 participants had missing answers. Another participant was  
248 excluded because the person knew the confederate and was familiar with the experiment.

249 For the R-PBS analysis, we excluded participants who had at least one missing  
250 item before, after, or at both measurements reducing the total sample size to 338  
251 participants. For repetition avoidance, we applied the same reasoning, and excluded  
252 participants who had at least one missing value before, after, or at both measurements  
253 reducing the sample size to 332 participants (see Table 1 for descriptive statistics).

#### 254 **Quantitative data**

255 According to a previous observation (Lesaffre et al., 2018), we accounted for confusion  
256 in the explanation ratings (appreciating conjuring and psychic explanations at the same  
257 time). We grouped participants into four explanation groups, according to whether they  
258 interpreted the event either as predominantly psychic, conjuring, using both explanations  
259 (confusion), or neither (see also Lesaffre et al., 2018). We did not consider religious  
260 explanations, because they were rare. We used the following criteria:

261 **Psychic explanation group:** participants rated the performance as being  
262 conducted by a genuine psychic. Scores were either  $>4$  for psychic explanation,  $\leq 4$  for  
263 conjuror explanation, or both  $\geq 4$  for psychic explanation and  $< 4$  for conjuror one.

264           **Conjurer explanation group:** participants rated the performance as being  
265 conducted by a conjurer. Scores were  $>4$  for conjuring explanation,  $\leq 4$  for psychic  
266 explanation, or both  $\geq 4$  for conjurer explanation and  $< 4$  for psychic explanation.

267           **Confusion explanation group:** participants rated the performance as being  
268 conducted by a psychic and conjurer at the same time. Scores were  $\geq 4$  for both  
269 explanations.

270           **Neither explanation group:** participants rated the performance as being neither  
271 done by a psychic nor a conjurer, with scores equal to or below 4 for both explanations.

## 272 **Qualitative data**

273 To code the responses to the open question, we coded the responses twice, once on  
274 opinion and once on feelings. For the actual coding, we had several trained raters (LL,  
275 DR, CD). A senior researcher with expertise in such coding (DJ) supervised the coding  
276 procedure, while being naïve to our study question.

## 277 **Opinion groups**

278 A priori, we were interested in whether participants would report that they were confused  
279 and also whether their own words would match the pre-determined themes as assessed  
280 by the event explanation scores (see also Benassi et al., 1980). In addition, we considered  
281 that this open question would reveal additional themes.

282           We first used the responses of a randomly chosen subgroup of participants ( $n =$   
283 100). We identified the presence of the three main themes, namely “Conjuror,” “Psychic,”  
284 “Religious.” During this first coding round, we identified a new group of responses, that  
285 is, responses we could not interpret (e.g., unclear formulations and/or content). We  
286 labelled these responses as “rater cannot determine.” Next, we tested the usefulness of  
287 our codes looking at the responses from a new group of 100 participants. We found no  
288 additional themes. We concluded that the saturation point had been reached and that our  
289 codes were adequate for coding the data. Pairs of raters were responsible for the final  
290 coding starting again with the complete response set. The results of the final coding  
291 showed a moderate interrater reliability, with a Kappa value of  $\kappa = .675$ . To account for  
292 chance ratings, we weighted raters’ decisions when calculating this Kappa value (Cohen,  
293 1968): we weighted zero when the raters agreed, we weighted the ratings as 1 when the  
294 raters’ decisions differed slightly (doubts-only versus doubt-bias-conjuror, doubts-only  
295 versus doubt-bias-psychic, psychic versus doubt-bias-psychic, conjuror versus doubt-  
296 bias-conjuror), and weighted the ratings as 2 when the raters’ decisions differed  
297 substantially (psychic versus conjuror). Disagreements were resolved through discussion.  
298 Further information on the final coding system including major categories, subcategories,  
299 and examples are given in the supplementary material.

300           **Conjuror group:** Participant reports that the performance has been realized by a  
301 magician / actor rather than a genuine psychic. We included participants who reported

302 that the performance was possible due to the performer's psychological abilities (not  
303 alluding to psychic powers or abilities).

304       **Psychic group:** Participant reports that the performance has been realized by a  
305 genuine psychic or someone who has a special gift.

306       **Religious:** Participant believes the performance was accomplished thanks to the  
307 power of god or another divine entity (djinn, devil, etc.)

308       **Doubts:** Participant does not know what to think of the performance. The  
309 participant hesitates to conclude between a genuine psychic or an actor. Despite these  
310 doubts, the participant tends towards one position more so than to another. The group  
311 “**doubts-bias-psychic**” includes participants who expressed doubts but tended towards a  
312 psychic explanation. The group “**doubts-bias-conjuror**” includes participants who  
313 expressed doubts but tended towards a fake psychic or actor. Finally, when participants  
314 did not take any position, they were included in the “**doubts-only**” group.

315       **Rater cannot determine:** The formulations and descriptions of the responses  
316 were such that the raters could not determine if the participant thought the performance  
317 was conducted by a genuine psychic, a conjuror/actor or through a religious miracle.  
318 Likewise, responses did not identify new themes.

319 **Affect groups**

320 We examined the affective reactions participants spontaneously expressed and decided to  
321 identify recurrent themes using a qualitative analysis approach influenced by “open  
322 coding” in grounded theory (Glaser & Strauss, 1968) as well as “clustering” or “theme  
323 identification” as referred to in more eclectic approaches (Miles & Huberman, 1994).  
324 Toward this aim, we again selected responses from a randomly chosen subgroup of  
325 participants ( $n = 100$ ).

326 We observed that a large number of participants expressed affective reactions  
327 varying in valence, that is, positive and negative. We also observed that participants  
328 mentioned the affectivity of the experience but did not further specify valence. Other  
329 participants reported that the experience was positive or negative, while others did not  
330 mention any feeling. Next, we tested the usefulness of our codes looking at responses  
331 from a new group of 100 additional participants. We found no additional themes. We  
332 concluded that the saturation point had been reached and that our codes were adequate  
333 for coding the data. Pairs of raters were responsible for the final coding, starting again  
334 with the complete response set of 200 participants. The results of the final coding showed  
335 an excellent interrater reliability, with a Kappa value of  $\kappa = .864$ . We again weighted  
336 raters’ decisions when calculating the Kappa value (Cohen, 1968), to account for chance  
337 ratings. We weighted zero when the raters agreed, we weighted 1 when the raters’  
338 decisions differed, and weighted 2 when raters provided a positive affect and a negative

339 affect rating. Disagreements were resolved through discussion. Further information on  
340 the final coding system and examples are given in the supplementary material.

341           **Positive affect:** Participant expresses only positive affect (e.g., happiness, solace,  
342 compassion, curiosity, etc.)

343           **Negative affect:** Participant expresses only negative affect (e.g., disturbed, fear,  
344 worry, uneasiness, stress, etc.)

345           **Unspecified affect:** Participant indicates that the performance was highly  
346 emotional (not defining the affective experience) or shares the intensity of the affective  
347 experience (e.g., intense, strong, etc.)

348           **Mixed affect** (e.g., moved, touched, surprised, impressed...): Participant  
349 expresses affect that is naturally ambiguous and mixed, in other words, affect that can be  
350 either positive or negative, or be both at the same time. We included participants who  
351 clearly expressed both positive and negative affect.

352           **No affect:** participant's response does not mention anything affective.

### 353 **Data analysis**

354 We first examined the data for normality using the Shapiro Francia Normality Test  
355 (Shapiro & Francia, 1972). Most of the variables were not normally distributed ( $p < .05$ ).  
356 Given our large sample size, we nevertheless performed parametric statistics (Ghasemi

357 & Zahediasl, 2012), apart from using Spearman correlations. We also examined the data  
358 for outliers, but none were identified.

359 To test whether pre-existing PBs correlate with post-performance explanation  
360 scores, we performed Spearman correlations between R-PBS scores (total, spiritualism)  
361 and the three explanation scores. To test whether explicit (R-PBS) or implicit (repetition  
362 avoidance) belief-related measures changed with the performance, we ran paired samples  
363 t-tests comparing repetitions in the mental dice task, R-PBS total scores, and R-PBS  
364 spiritualism scores before and after the performance.

365 To test the way participants might confuse various levels of explanations (Lesaffre  
366 et al., 2018), we also examined how participants responded to the different event  
367 explanation scores. We were particularly interested in the proportion of participants  
368 having a clearly psychic, conjuring, or confused explanation, or no explanation,  
369 comparing the frequencies in these groups using chi-square comparisons.

370 To account for the possibility that psychic explanations could be explained by  
371 participants' confused and affective reactions after the performance, we compared  
372 explanation scores between (1) opinion groups (conjuror, psychic, doubt-bias-psychic,  
373 doubt-bias-conjuror, doubts-only), and (2) affect groups (positive, negative, unspecified,  
374 mixed, none). For each type of group, we conducted separate multivariate analysis of  
375 variance (MANOVA) on the three explanation scores. We used Pillai's trace test statistic,

376 because of its robustness to model violations (Olson, 1976). Post-hoc pairwise  
377 comparisons were conducted using Tukey tests. Alpha levels were set at .05 for all  
378 statistical tests.

## 379 **Results**

### 380 **Effect of pre-performance measures (R-PBS total, R-PBS spiritualism, repetition** 381 **avoidance) on explanation scores (post-performance)**

382 The correlations between pre-performance measures and explanation scores showed the  
383 expected relationships such that belief scores (R-PBS total, R-PBS spiritualism)  
384 positively correlated with psychic explanation scores and negatively correlated with  
385 conjuring explanation scores (Table 1). R-PBS total scores also correlated positively with  
386 religious explanation scores. Repetitions before the performance correlated positively  
387 with conjuring explanation scores (Table 1). Additionally, psychic explanation scores  
388 correlated negatively with conjuring explanation scores, and correlated positively with  
389 religious explanation scores (Table 1).

390 **-PLEASE INSERT TABLES 1 AND 2 AROUND HERE-**

### 391 **Comparing belief scores and repetition avoidance before and after the performance**

392 Paired sample t-tests showed no differences in R-PBS total score before and after the  
393 performance. However, there were significantly higher R-PBS spiritualism scores and  
394 significantly more repetitions after as compared to before the performance (Table 2).

395 **Event explanation scores and groups**

396 Table 3 presents the event explanation scores (means and standard deviations), as well as  
397 how often the various explanation scores (range 1 to 7) were used (Table 3). In descriptive  
398 terms, the bold numbers show that a score of 7 was most frequently given for psychic  
399 explanations, while a score of 1 was most frequently given for conjuring and religious  
400 explanations, with another peak at the score of 4 (in italic, Table 3).

401 The distributions of participants belonging to the psychic, conjuring, confusion,  
402 or neither explanation groups (Figure 1) were not evenly distributed,  $\chi^2(3) = 372, p <$   
403  $.001$ . Individual comparisons using standardized residuals (Field, 2018) showed that the  
404 psychic explanation group was overrepresented ( $p < .001$ ), the confusion and conjuror  
405 explanation groups were underrepresented (both  $p < .001$ ), and the neither group was not  
406 different from what would be expected by chance ( $p < .05$ ).

407 **-PLEASE INSERT FIGURE 1 AND TABLE 3 AROUND HERE-**

408

409 **Groups resulting from the qualitative data**

410 **Explanation scores between opinion groups**

411 We coded the following responses from 385 participants: 167 expressed doubts, 120  
412 talked clearly about a psychic event, and 60 about a conjuror event (see Figure 2).  
413 Responses from about 10% of the sample could not be interpreted (38 out of 347

414 responses, Figure 2). Moreover, of the participants who expressed doubts, about half had  
415 a preferred explanation (psychic:  $n = 45$ ; conjuror:  $n = 30$ ).

416 The MANOVA tested how our pre-determined explanation scores varied  
417 according to what people freely reported (opinion groups). The major comparison was  
418 significant, Pillai's trace,  $V = .61$ ,  $F(5, 379) = 19.50$   $p < .001$ . Subsequent separate  
419 univariate analyses of variance on explanation scores were all significant; psychic  
420 explanation scores,  $F(5, 379) = 99.6$ ,  $p < .001$ , conjuring explanation scores,  $F(5, 379) =$   
421  $7.46$ ,  $p < .001$ , and religious explanation scores,  $F(5, 379) = 6.51$ ,  $p < .001$  (see also  
422 Figure 2).

423 For psychic explanations scores (Figure 2A), pairwise Tukey comparisons  
424 showed that scores were lowest in the conjuror explanation group as compared to all other  
425 groups (all  $p$ -values  $< .001$ ). The next lowest scores were found for the doubt-bias-  
426 conjuror explanation group, which were significantly different from all other groups (all  
427  $p$ -values  $< .001$ ). Highest scores were found in the psychic group, which scored  
428 significantly higher than all other groups (all  $p$ -values  $< .001$ ). The second highest scores  
429 were in the doubt-bias-psychic group, which scored significantly higher than the other  
430 groups (biggest  $p$  value = .02), with the exception of the rater cannot determine group ( $p$   
431 = .37). Lastly, the rater cannot determine group and the doubt-only group were not

432 significantly different from each other ( $p = .97$ ), but were significantly different from the  
433 other groups (highest  $p$ -value = .02).

434 For conjuring explanation scores (Figure 2B), pairwise Tukey comparisons  
435 showed little differences between groups (all non-significant  $p$ -values  $> 0.05$ ). Mean  
436 scores were all below 4.0. We found lower scores in the psychic group as compared to  
437 the doubt-only ( $p < .001$ ), conjuror ( $p < .001$ ), doubt-bias-conjuror ( $p = .008$ ), and rater  
438 cannot determine ( $p = .004$ ) groups.

439 For religious explanation scores (Figure 2C), pairwise Tukey comparisons did not  
440 show many differences between groups (all non-significant  $p$ -values  $> 0.05$ ). Mean scores  
441 were all below 4.0. We found lower scores in the conjuror group as compared to the  
442 doubt-only ( $p = .002$ ), psychic ( $p < .001$ ), and doubt-bias-psychic ( $p = .011$ ) groups. Also,  
443 higher scores were found in the psychic, as compared to the doubt-bias-conjuror group ( $p$   
444 = .031).

445 **-PLEASE INSERT FIGURE 2 AROUND HERE-**

446

#### 447 **Explanation scores between affect groups**

448 From 387 participants who completed the open question, we had responses that we could  
449 code as follows: 225 expressed affective reactions, while 162 did not report their feelings.

450 Eighty participants expressed affective reactions that conveyed a clearly valanced

451 experience (positive or negative), 24 reactions were unspecified, and 121 reactions  
452 conveyed mixed experiences (see Figure 3).

453 This MANOVA tested whether pre-determined explanation scores differed  
454 between affect groups. The major comparison was significant, Pillai's trace,  $V = .21$ ,  $F(4,$   
455  $382) = 7.14$ ,  $p < .001$ . Subsequent, separate univariate analyses of variance on explanation  
456 scores were significant: psychic explanation scores,  $F(4, 382) = 20.6$ ,  $p < .001$ , conjuring  
457 explanation scores,  $F(4, 382) = 2.58$ ,  $p = .037$ , and religious explanation scores,  $F(4, 382)$   
458  $= 2.95$ ,  $p = .020$ .

459 For psychic explanation scores (Figure 3A), Tukey tests showed that the no affect  
460 group yielded the lowest scores when compared to all other groups (all  $p$ -values  $< .02$ )  
461 (Figure 3). Moreover, scores were lower in the negative affect group when compared to  
462 the mixed affect group ( $p = .003$ ) (Figure 3). For conjuring explanation scores, Tukey  
463 tests showed comparable scores between groups (all  $p$ -values  $> 0.05$ ) apart from a lower  
464 score in the mixed affect group as compared to the negative affect group ( $p = .049$ ). For  
465 religious explanation scores, Tukey tests showed comparable scores between groups (all  
466  $p$ -values  $> 0.05$ ) apart from a lower score in the no affect group as compared to the  
467 unspecified affect group ( $p = .022$ ).

468 **-PLEASE INSERT FIGURE 3 AROUND HERE-**

469

470 **Discussion**

471 Paranormal Beliefs (PBs) are frequent in the adult population, and numerous  
472 psychological variables that are associated with PBs have been reported (see e.g. French  
473 & Stone, 2013; Irwin, 2009; Vyse, 2013 for reviews). However, little is known about the  
474 causal mechanisms behind these variables, including their formation and persistence. In  
475 our study, participants were exposed to a supposedly paranormal event, and we assessed  
476 key measures before and after the event. Moreover, we examined the extent to which  
477 these baseline measures predict what people think and feel about the event. Our  
478 performance consisted of a medium making contact with a confederate's deceased kin,  
479 and we observed that many participants were confused about the true nature of the  
480 performance and reported strong affective reactions (Lesaffre et al., 2018).

481         We aimed to better understand the nature of both this confusion and emotional  
482 affect, and whether they predicted paranormal explanations. We directly asked about  
483 participants' opinions and feelings about the staged medium demonstration. About 65%  
484 of our sample gave psychic explanations (see also Benassi et al., 1980). A more detailed  
485 analysis revealed that lower paranormal explanation scores were found in participants  
486 who (1) assumed, not surprisingly, that the performer was a conjuror, or doubted that the  
487 performer could have been a conjuror, and (2) did not report on affective feelings when  
488 answering to the open question.

489           Before discussing our major results on confusion and affect, we wish to highlight  
490 that we replicated previous findings on independent samples of United Kingdom students  
491 (Lesaffre et al., 2018; Mohr et al., 2015). We also found that higher R-PBS total scores  
492 correlated positively with psychic and religious explanation scores and negatively with  
493 conjuring explanation scores (Lesaffre et al., 2018; Mohr et al., 2015). We then replicated  
494 that psychic scores negatively correlated with conjuring explanation scores, and psychic  
495 explanation scores correlated positively with religious explanation scores (Lesaffre et al.,  
496 2018; Mohr et al., 2015). Finally, we replicated that R-PBS total scores did not change  
497 from before to after the performance (Lesaffre et al., 2018; Mohr et al., 2015). On this  
498 background, it is interesting to note that R-PBS spiritualism scores were significantly  
499 higher after as compared to before the performance. This increase supports the  
500 importance of actual experiences in forming related paranormal beliefs (French &  
501 Wilson, 2007; Glicksohn, 1990; Irwin et al., 2013; Lan et al., 2018).

502           We tested whether participants' confusion and feelings might explain whether,  
503 and to what extent, participants endorse psychic explanations. When looking at the  
504 explanation groups, the largest group (about 65% of participants) considered that they  
505 saw a genuine psychic event. Only about a tenth of our participants indicated that they  
506 had witnessed a conjuring event. In the current study, a small proportion of participants  
507 (2%) endorsed both psychic and conjuring explanations, while about a quarter endorsed  
508 neither of these explanations. The latter group might have been uncertain what to think

509 about this experience. The coding of the open question showed that about half of all  
510 participants expressed doubts, with about a quarter favoring the notion that they saw a  
511 psychic, and another quarter that they saw a conjuror. About a third assumed having seen  
512 a psychic and about 15 percent having seen a conjuror. The coding of the affective  
513 reactions showed that about two thirds of the participants reported on their affective  
514 feelings. The remainder did not mention affective feelings. Also, about one third of all  
515 participants reported mixed affective feelings (positive *and* negative), while only a third  
516 expressed clearly negative or positive feelings. Overall, coding of the responses to the  
517 open question indicated that doubt and mixed feelings were widely shared reactions.

518         When testing whether psychic explanations differed between opinion and affect  
519 groups, it is worth highlighting that psychic explanations were overall much higher than  
520 conjuring and religious explanations. Only psychic explanations ranged beyond the mid-  
521 point on the 7-point Likert scale (see also Lesaffre et al., 2018). When now accounting  
522 for opinion and affect groups, psychic explanations were high in all opinion and affect  
523 groups, apart from relatively lower psychic explanation scores in the conjuror group,  
524 doubt-bias-conjuror group, and no affect group. In numbers, these groups represent a  
525 relatively small part of the sample. Most participants belonged to the psychic, doubts-  
526 only, doubt-bias-psychic, rater cannot decide, positive affect, negative affect, unspecified  
527 affect, and mixed affect groups. It seems that participants who have alternative  
528 explanations (conjuror, doubt-bias-conjuror) about what they have just seen (a performer

529 talking to a deceased person) are also those who are less inclined to favor the obvious  
530 interpretation, that is, having seen a genuine psychic event. It also seems that less obvious  
531 explanations are more readily available to participants whose affective reactions are not  
532 the prevalent preoccupation when answering the brief question "Please indicate your  
533 feelings and opinions regarding the performance you have just seen."

534         Strong links between affective reporting and psychic explanations may be  
535 explained by previous studies that examined affectivity and PBs. Frijda et al. (2000)  
536 stressed that "[emotions] are at the heart of what beliefs are about" (pp. 3). The authors  
537 showed that feelings were expressed in many ways (positive, negative, unspecified,  
538 mixed). However, the situation and context of our experiment might have been  
539 experienced very differently among participants. Participants sat in a large classroom,  
540 peers sitting close, some might have focused on the slightly clumsy performer, others on  
541 the emotional confederate. Still others might have focused on their own fears and hopes.  
542 Previous studies have shown some people find PBs reassuring, since they can provide  
543 explanations for the unknown (Heine et al., 2006; Wyer & Albarracín, 2005). Indeed,  
544 PBs may provide a sense of control, even if illusory (Boden & Gross, 2013). In difficult  
545 situations, PBs enhance or preserve positive emotions, while diminishing negative ones  
546 (Boden & Gross, 2013). Some people also find PBs and spirituality useful when having  
547 to manage stressful life events (Keinan, 2002; Mascaro & Rosen, 2006; Tuck et al., 2006).  
548 It is therefore possible that the affective arousal, rather than the positive or negative

549 valence of the situation (Lazarus, 1991; Tversky & Kahneman, 1982) facilitates psychic  
550 explanations.

551         Our final observations concern the results of the mental dice task. First, more  
552 repetitions were associated with more conjuring explanations. Second, repetition  
553 avoidance was lower after as compared to before the performance. The first finding  
554 complements previous findings in that less repetitions were associated with higher PBs  
555 (Brugger et al., 1990; Lesaffre et al., 2018). The second finding is counter to our  
556 prediction (increase in repetition avoidance) (Bressan, 2002; Brugger et al., 1990), and  
557 different from previous, closely related studies that report no change in repetition  
558 avoidance from before to after the performance (Lesaffre et al., 2018; Mohr et al., 2015).  
559 It is possible that our reduction in repetition avoidance resulted from high levels of  
560 arousal. A large proportion of our participants reported high levels of arousal, which may  
561 have interfered with performing the mental dice task. As indicated by our qualitative  
562 coding, many participants reported on their emotions and doubts, which is likely to have  
563 drawn attention and engagement away from the mental dice task. Brugger, Monsch,  
564 Salmon, and Butters (1996) investigated random number generation in Alzheimer  
565 patients, and they posited that higher levels of repetitions in these patients may have  
566 resulted from impaired frontal executive functions, in particular attentional functions. As  
567 a result, a lack of task focus, may result in more repetitions. However, we do not wish to  
568 make a strong case for the finding on the mental dice task and our current explanation.

569 We report the mental dice task results for scientific transparency, and our preliminary  
570 interpretation of the data should be taken with caution. We have used the mental dice task  
571 in many published (e.g., Lesaffre et al., 2018; Mohr et al., 2015) and unpublished studies,  
572 and found rather inconsistent findings, which has made us rather uncertain about its  
573 reliability.

#### 574 **Limitations and future challenges**

575 We examined belief and experience items using paranormal belief questionnaires,  
576 desirability effects, and the affectivity of the event. One limitation relates to our sample,  
577 which consisted of an intact group; thus this group of participants (i.e., a class) was  
578 established prior to the research. Therefore, the results might not be generalized to the  
579 wider public. Secondly, the questionnaire (R-PBS, Tobacyk, 2004) focused on beliefs  
580 rather than experiences. The participants experienced a supposedly paranormal event  
581 right in front of their eyes, and we might have obtained different results had we included  
582 belief questions that focus on people's past paranormal experience, such as done for a  
583 recently published self-report questionnaire (Prike et al., 2017). Experiences might be  
584 relevant in other ways too. Total R-PBS scores did not increase after the performance,  
585 while R-PBS spiritualism scores did. When looking at item formulations, the wording for  
586 the R-PBS spiritualism scores were more related to participants' experience than the  
587 questions in the other subscales. Our questionnaire findings could also reflect a  
588 desirability effect: participants might have answered in conformance with the

589 experimenter's expectancy. Yet, to fully explain the results, participants would have  
590 needed to (1) know which items belonged to which subscale, and (2) remember how they  
591 had answered during their baseline questionnaire in order to increase their R-PBS  
592 spiritualism score. We doubt that participants applied such a strategy. To further support  
593 our view, while not quantified, the classroom was fully engaged in the performance.  
594 Many students stormed forward at the end of the experiment because they wanted to talk  
595 to the performer. They asked him about his skills, and whether he would be willing to use  
596 his skills for their purposes too.

597         This brings us to the final point – the affectivity of the event. The qualitative  
598 analysis showed many affective reactions. Many participants reported feeling empathetic  
599 with our confederate (Emmanuelle) or our psychic (Gregory). They also reported being  
600 shocked by what they had experienced. Content coding revealed that participants reported  
601 on valanced reactions (negative or positive), mixed reactions (positive and negative),  
602 unspecified reactions (intense but ambiguous valence), or did not mention their affective  
603 reactions at all. The latter category was relatively frequent. However, not reporting on  
604 affective reactions does not imply that no affective reactions had occurred. Interesting in  
605 this regard, the no affect group scored closest to the negative affect group when looking  
606 at the event explanation scores. Perhaps, the no affect group had experienced negative  
607 affect, but refrained from reporting on these reactions. Such a possibility could be tested  
608 by formulating a priori questions, and by adding objective measures sensitive to variation

609 in affect. For instance, one could assess psychophysiological measures such as heart rate.  
610 In case such measures are used, their variation could be matched to variation in psychic  
611 explanations due to intense emotional arousal. As already noted above, the arousing  
612 character of the situation (Lazarus, 1991; Tversky & Kahneman, 1982) might facilitate  
613 psychic explanations. If this suggestion is true, future studies could compare the current  
614 type of performance with a recently used performance of pseudo-psychological nature  
615 (Lan et al., 2018).

#### 616 **Conflict of Interest Statement**

617 The authors declare that the research was conducted in the absence of any  
618 commercial or financial relationships that could be construed as a potential conflict of  
619 interest.

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799 **Table 1.** Spearman correlation coefficient comparing pre-performance measures (R-  
 800 PBS total scores, R-PBS spiritualism scores, MDT repetitions with event explanation  
 801 scores).

	R-PBS total	Spiritualism	MDT rep.	Explanation scores	
				psychic	conjuring
Spiritualism	.77***				
MDT rep.	.06	.07			
Explanations	psychic	.42***	.33***	-.02	
	conjuring	-.11*	-.13*	.14**	-.23***
	religious	.27***	.09	.03	.33***

\*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ ; R-PBS total= Revised Paranormal Belief Scale total scores; Spiritualism= R-PBS spiritualism scores; MDT rep.= Mental Dice Task repetitions (repetition avoidance).

802 **Table 2.** Descriptive statistics and results from paired sample t-tests comparing  
 803 measures before and after the performance.

		N	Mean	SD	t value	p value
R-PBS total	before	338	2.85	0.90	.105	.916
	after	338	2.85	0.97		
Spiritualism	before	338	3.31	1.40	6.169	<.001
	after	338	3.60	1.58		
MDT repetitions	before	332	5.60	4.93	2.886	.004
	after	332	6.22	5.55		

R-PBS total= Revised Paranormal Belief Scale total score; Spiritualism= R-PBS spiritualism scores; MDT repetitions= Mental Dice Task repetitions (repetition avoidance).

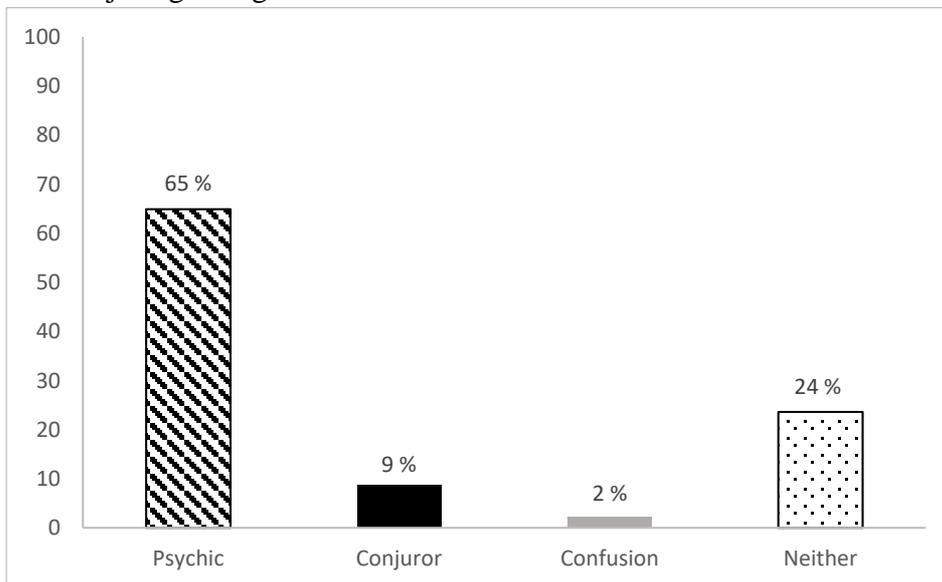
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807 **Table 3.** Descriptive statistics and distribution of answers for explanation scores (psychic,  
 808 conjuror, religious). The counts per scale score (1-7) are also shown. Bold numbers depict  
 809 the lowest and highest possible scores of 1 and 7. The italicized numbers depict the mid-  
 810 score of 4.

Explanation	N	Mean	SD	<b>1</b>	2	3	<i>4</i>	5	6	<b>7</b>	No answer
Psychic	388	4.69	2.13	<b>55</b>	33	6	<i>79</i>	35	69	<b>111</b>	2
Conjuring	389	2.19	1.61	<b>199</b>	78	19	<i>59</i>	15	5	<b>14</b>	1
Religious	389	1.94	1.53	<b>253</b>	39	16	<i>50</i>	15	11	<b>5</b>	1

*Scores from 1 to 7 refer to the prevalence of each Likert scale score for each explanation question.*

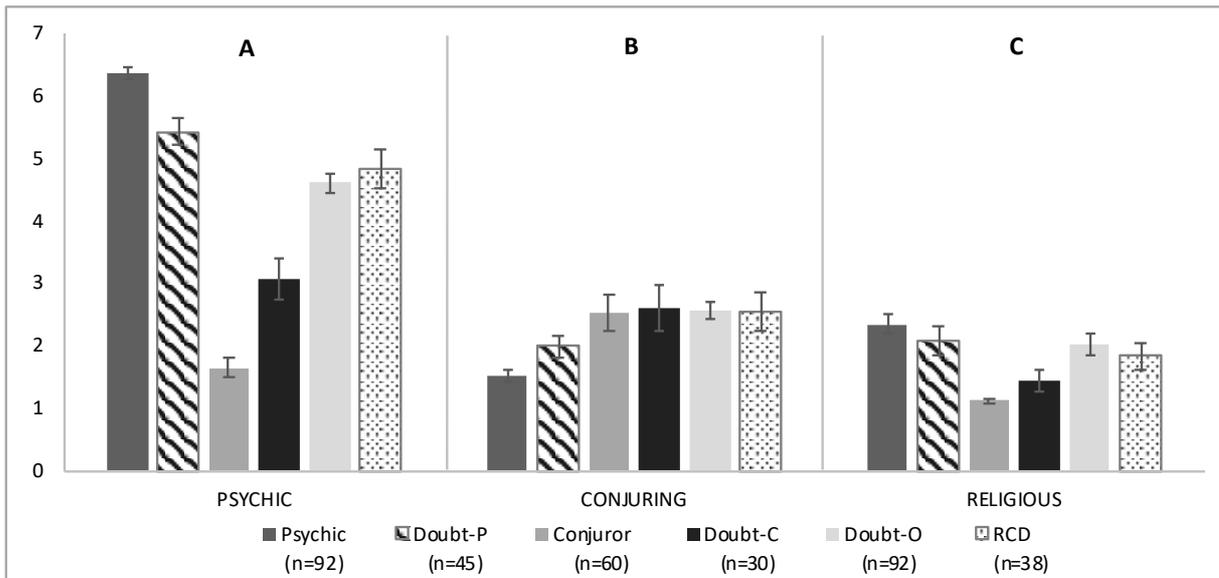
811 **Figure 1.** Proportions (%) of participants allocated to the different explanation groups  
 812 according to their answers on both the psychic and conjuring explanation questions.  
 813 Percentages do not add up to 100%, because two persons did not provide both the psychic  
 814 and conjuring ratings.



815

816 **Figure 2.** Mean explanation scores as a function of opinions groups and as a function of  
 817 psychic explanation scores (A), conjuring explanation scores (B), and religious  
 818 explanation scores (C). Columns depict the opinion groups Psychic, Doubt-bias-psychic  
 819 (Doubt-P), Conjuror, Doubt-bias-conjuror (Doubt-C), Doubt-only (Doubt-O), Rater  
 820 Cannot Determine (RCD). Vertical bars denote  $\pm$  one standard error of the means.

821



822 **Figure 3.** Mean explanation scores as a function of affect groups and as a function of  
 823 psychic explanation scores (A), conjuring explanation scores (B), and religious  
 824 explanation scores (C). Vertical bars denote  $\pm$  one standard error of the means.  
 825

