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1   Robot-Mediated Interviews with Children: What do potential users think?

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5   Abstract

6   To date research investigating the potential of Robot-Mediated Interviews (RMI) has

7   focused on establishing how children respond to robots in an interview scenario. In order to

8   test if an RMI approach would work in a real world setting, it is important to establish what

9   the experts (e.g. specialist child interviewers) would require from such a system. To

10   determine the needs of such expert users we conducted three user panels with groups of

11   potential real world users to gather their views of our current system and find out what they

12   would require for the system to be useful to them. The user groups consisted of specialist

13   police officers, intermediaries, educational specialists and healthcare specialists. To our

14   knowledge this is the first article investigating user needs for Robot-Mediated Interviews.

15   Due to the novelty of this work, the work presented in this paper is exploratory in nature.

16   The results provide valuable insights into what real world users would need from a Robot-

17   Mediated Interviewing system. Our findings will contribute to future research and

18   technology development in the domain of RMI in particular, and child-robot interaction in

19   general.

20   **1 Introduction**

21   The use of social robots for children has been explored by various research groups in a

22   number of different domains. One area that appears to be particularly promising is the

23   application of social robots for children with special needs such as autism. Recent research

24   has investigated how robots could potentially be used in an interview scenario with both

25   neuro-typical children and children with special needs (Bethel, Eakin, Anreddy, Stuart, &

26   Carruth, 2013; Bethel, Stevenson, & Scassellati, 2011; Wood, Dautenhahn, et al., 2013a,

27   2013b; Wood, Dautenhahn, Rainer, et al., 2013). To date research investigating Robot-

28   Mediated Interviews (RMIs) has focused on researchers directly working with children to

29   test the concept and establish how children respond to a robot in an interview setting. The

30   next logical step is to establish what real world users would require from a RMI system. If

31   robots are to be used for this application in a real world setting, showing that RMIs work in

32   theory with a rigid set of questions and a technical user at the controls is not sufficient. The

33   system needs to usable by experts who have experience and specialist training for

34   interviewing children. To address this question we conducted three separate user panels with

35   potential real world users.

36   **2 Background**

37   Research investigating the potential of social robots has covered a wide variety of concepts

38   from robotic pets such as the AIBO dog (Barlett, Estivill-Castro, & Seymon, 2004), to

39   huggable robots such as PROBO (Saldien, Goris, Yilmazyildiz, Verhelst, & Lefeber, 2008),

40   to general humanoid robots such as NAO for investigating a range of HRI scenarios

41   (Kruijff-Korbayová et al., 2011). There has also been a considerable amount of research

42   investigating how robots such as KASPAR and Keepon can be used to help children with

43   special needs on various aspects of social interaction (Kozima, Michalowski, & Nakagawa,

44   2009; Robins, Dautenhahn, & Dickerson, 2009; Wainer, Dautenhahn, Robins, &

45   Amirabdollahian, 2014). One of the most recent applications being explored with robots

46   such as KASPAR and NAO is the possibility of Robot-Mediated Interviews (Bethel, et al.,

47   2011; Wood, Dautenhahn, et al., 2013a, 2013b; Wood, Dautenhahn, Rainer, et al., 2013).

48   RMI is an application area where robots are used as an interface to interview young children.

49   Recent studies suggest that children respond to a robot in an interview scenario similar to

50   how they respond to a human interviewer (Bethel, et al., 2011; Wood, Dautenhahn, Rainer,

51   et al., 2013). However, there may be some potential advantages to using a robot, particularly

52   in sensitive cases, or cases involving children with special needs. Case studies investigating

53   how children with special needs respond to robots in an interview situation have found that

54   in some instances the children appear to be more engaged with a robotic interviewer (Wood,

55   Dautenhahn, et al., 2013a).

56   Prior to conducting our research into the possibility of RMIs, two specialist police officers

57   from the Metropolitan Police were consulted for advice on how to conduct interviews with

58   children. When police officers are conducting interviews with children that have been

59   through a stressful or traumatic ordeal, the information that a child discloses can be quite

60   shocking and surprising. The officers stated that in these situations it can be difficult for the

61   interviewer to maintain their composure without subtly and unintentionally indicating their

62   thoughts and feelings, despite their extensive training. Children can sometimes recognise

63   these subtle indications, and this can have a detrimental effect on the child's ability or

64   willingness to recall events during an interview. Using a robotic interviewer could address

65   this problem because the expressions and body language of the robot can be controlled

66   precisely. Aside from ensuring that the child does not detect any reaction of shock or

67   surprise in the interviewer, it is also important that an interviewer does not appear to be

68   judgemental and must conduct the interview in a neutral manner. It is therefore very

69   important that the body language of the interviewer does not influence the child (UK

70   Government, 2011, pp. 66). Recent research suggests that body language can play a role in

71   misleading witnesses. Gurney, Vekaria, & Howlett (2013) found that participants who

72   received positive nonverbal feedback whilst being interviewed were more confident with

73   their answers than participants who received negative nonverbal feedback. In their study

74 positive nonverbal feedback was a subtle nod of the head and negative feedback was a subtle

75 shake of the head. Nonverbal behaviours such as facial expressions and hand gestures are

76 often produced automatically and spontaneously (Ekman, 2003; Krauss, 1998; McNeill,

77 1992). Gurney et al. (2013) concluded that "common nonverbal behaviours (head nodding

78 and shaking) that are likely to occur in interviews can have an impact on eyewitnesses'

79 confidence judgements." (Gurney, Vekaria, Howlett, 2013, pp. 6), and highlights that "By

80 altering the confidence witnesses attribute to their testimony, police interviewers can

81 manipulate precisely the quality that eyewitnesses are often judged upon." (Gurney, Vekaria,

82 Howlett, 2013, pp. 16). In a courtroom scenario jurors often place a lot of trust in confident

83 eyewitness (Bradfield & Wells, 2000), therefore it is important to ensure that both the

84 questions and body language of the interviewer are not leading. Using a robot to interview a

85 person could eliminate the subtle unintentional signs of body language that a human

86 interviewer may give away as the body language of the robot can be fully and precisely

87 controlled by the interviewer.

88 In addition to body language the mere perception of a person's authority can sometimes

89 have an effect on a witness, particularly with regards to suggestibility (UK Government,

90 2011, pp. 56). The Achieving Best Evidence (ABE) document used by police in the UK

91 suggests that reducing the perceived difference in authority between the interviewer and

92 witness can reduce the possibility of a witness complying with a leading question, "Paying

93 attention to the appropriate form of address at this initial greeting phase can help send a

94 message of equality both now and throughout the interview. This is essential as it reduces

95 the perceived authority differential between interviewer and witness, so that witnesses are

96 less likely to comply with leading questions. As no interview can be perfect, it is essential to

97   build resistance against inappropriate questions, which may unwittingly be used by an

98   interviewer later in the interview." (UK Government, 2011, pp. 187). Using a robot such as

99   KASPAR could address this problem because the robot is clearly not a human being may

100   not be viewed in the same way.

3 Methods

102   In order to establish if RMIs would be genuinely useful to real world users we conducted

103   three user panels with a range of experts that work with children, and who may potentially

104   want to use such a system. When conducting the user panels we aimed to answer two main

105   research questions:

106   •   RQ-1: Do experts working with children think that a Robot-Mediated Interview

107   approach could be useful in their field?

108   •   RQ-2: What would experts working with children require from a Robot-Mediated

109   Interviewing system?

110   Gathering answers to these questions and involving the users in the design process is often

111   referred to as UCD (User Centred Design). UCD helps to ensure that the user's needs are

112   met by ensuring that the user, requirements and the context of use are clearly defined (ISO,

113   1999; Norman & Draper, 1986; Scaife, Rogers, Aldrich, & Davies, 1997). UCD is often a

114   recursive process involving multiple iterations of feedback throughout the evolution of a

115   system or design. Because RMI is relatively new field of research, these are amongst the

116   first user panels to be conducted in this area. Feedback received from the experts allowed us

117   to critique the research carried out to date, and draw a set of requirements that real world

118   users would need from an RMI system.

119 **3.1 Participants**

120 The three user panels were conducted at separate locations with a total of 20 participants.

121 The panel of specialist police officers police consisted of 11 participants, the intermediaries'

122 panel consisted of 5 participants, and the interdisciplinary panel consisted of 4 participants.

123 Although the police and intermediary panels contained professionals from two specific

124 organisations, there was a mix of participants that performed a variety of different roles with

125 differing and diverse skill sets. Because of the exploratory nature of this research, the

126 diversity of the panels aided in viewing the potential areas where this technology could

127 possibly assist and also served to create a relatively comprehensive picture of what would be

128 required by the different user groups. The participants of the panels had no prior knowledge

129 of this particular area of research involving robots. The research was approved by the

130 University of Hertfordshire's ethics committee for studies involving human participants

131 (protocol number: 1213/18). Prior to data collection, informed consent was obtained in

132 writing from all of the participants taking part in the panels.

133   **User panel #1: Police specialists, 11 participants**

134 The first panel was held with a specialist joint child protection investigation team. The team

135 consists of both police officers and social workers that specialise in working with children.

136 The members of the team continually undergo specialist training that provides them with

137 specific skills to interview vulnerable victims and witnesses. The types of cases that the

138 team would deal with include internet-based child abuse, complex abuse enquiries within a

139 family environment, sexual abuse of children, and child homicide. In many of these cases it

140 is necessary to interview the children to gather evidence, therefore conducting interviews

141 with children is a routine job for many members of this team. Since the members of this

142 investigation team have to deal with such a wide variety of cases on a daily basis, it puts

143 them in a strong position to provide meaningful feedback about the possibility of a RMI

144 approach in a police interview setting and what would be required from such a system.

145 **User panel #2: Intermediaries, 5 participants**

146 The second panel was held with a team of intermediaries that specialise in facilitating

147 communication with children that have various special needs including: learning disabilities,

148 autism, mental health difficulties, ADHD, and physical disabilities. The intermediaries have

149 particularly strong expertise in communicating with children who do not use speech, have

150 complex health care needs, or are affected by other conditions such as autism. The

151 intermediary team includes both adults and young people who have a disability, and

152 advocates who can communicate using sign language, symbols and a variety of activity or

153 play based approaches. The expertise of the intermediaries means that they have assisted

154 with many complex situations including: child protection investigations, criminal court

155 proceedings and family court proceedings. The team was founded over fifteen years ago and

156 has consulted with more than 4000 children and young people over that period, and are

157 therefore in a strong position to offer sound advice and feedback.

158 **User panel #3: Interdisciplinary user group, 4 participants**

159 The final panel consisted of a multidisciplinary group, including an educational specialist, a

160 magistrate who was previously the head of a service for young people with medical

161 conditions, a paediatric nurse and health visitor, and a specialist in speech and language who

162 has a background in teaching deaf children. The diversity of this group provided a wide

163 variety of perspectives on the potential applications for a RMI system.

164   The members of the three panels, including a variety of potential expert users of RMIs, were

165   in a strong position to provide a very clear and relatively complete overall picture as to what

166   potential real word users working with children would require from a RMI system, along

167   with the potential advantages and pitfalls associated with such a system.

168   **3.2 Procedure**

169   Each user panel lasted approximately 90 minutes, and whilst the discussions were taking

170   place, notes were taken by the lead investigator to highlight any key points that were made.

171   Sessions were also audio recorded and later transcribed to capture the points and feedback

172   that had not been noted during the sessions (the first user panel was not recorded due to

173   technical difficulties). The sessions began by providing a brief background to the research,

174   in particular the previous studies that had taken place. The methodology used for the user

175   panels was a focus group (Gilbert, 2008). The background covered an overview of the

176   KASPAR robot, detailing the previous work conducted with children with autism. This was

177   followed by a detailed description of the previous studies we conducted on RMIs (Wood,

178   Dautenhahn, et al., 2013a, 2013b; Wood, Dautenhahn, Rainer, et al., 2013). Details of the

179   studies provided to the panel members included: purpose of study, structuring of experiment,

180   topic of the interviews and findings of the studies. Sample videos of the studies were shown

181   to illustrate the RMI system in practice. The videos that were selected were chosen to show

182   the RMIs maximum potential. Four videos were shown to each panel, two showing sessions

183   with typically developing children and two of sessions with children with special needs. We

184   showed examples of RMI for both groups of children in order to illustrate that RMI could

185   potentially be used with different children. Approximately 3 minutes of each clip was shown

186   to the panellists to give them an overview of how the system worked and how the children

187   responded. The selection of videos illustrating work from previous studies allowed us to

188   gather feedback from the panellists to answer the first research question. Immediately after

189   the introduction and background, the participants were asked a number of questions. The

190   principle investigator acted as a low-level moderator when facilitating the discussions to

191   allow the groups to freely explore the domain and options (Gilbert, 2008). Although the

192   examples of our work on RMIs used the KASPAR robot, the questions were targeted at

193   being general to encompass other potential robots that may be applicable for RMIs. The

194   questions that the participants were asked are as follows:

195   UPQ-1) From what you have seen, do you think that this is a tool that could be useful to

196   you?

197   UPQ-2) Do you think you would use a tool like this? If so…

198   • How and at what stage?

199   • With what children?

200   UPQ-3) Can you think of any specific scenarios where a tool like this would be

201   particularly useful?

202   UPQ-4) How would you expect to operate this robot?

203   UPQ-5) What would be the most important features you would expect to see in an

204   interface?

205   After gathering feedback for these questions the participants were then briefed on the

206   operation of the robot. It was explained that during our previous studies the scenario and

207   setup was highly scripted and pre-programed. All of the potential paths for the interaction

208   had been accounted for (within the scope of the study), and all of the robot's responses had

209   been pre-recorded in anticipation of the children responses. Details of how the robot was

210　operated were specifically withheld from the participants prior to the initial feedback in an

211　effort to avoid constraining the thought process of the participants on how the robot should

212　be operated. After the participants had been fully briefed on how the robot was operated in

213　previous studies, we begun to gather a set of features that the participants would require

214　from a RMI system to answer the second research question. The questions that we asked the

215　participants were as follows:

216　　UPQ-6) What features must the interface for the robot have?

217　　UPQ-7) What features would you like to have?

218　　UPQ-8) Could you rank the importance of the features?

219　These questions concluded the session and provided a clearly defined set of user

220　requirements to adhere to, when developing a new RMI interface that could be used by an

221　expert working with children.

222　　　　　　　　　　**4 Results and discussion**

223　The findings from the panels are split into 5 sections, each of which addresses an aspect

224　relating either to the completed research or suggestions for the future direction of work, see

225　Table 4.1.

Table 4.1: Each section answers one or more of the User Panel Questions (UPQ)

Section	UPQ
Feedback on previous work	1
Would experts use this system and where do the main benefits lie?	1, 2, 3
Potential complications and advantages of Robot-Mediated Interviews	1, 3
Aesthetics of the robot	4
Interface and operation of the robot	4, 5, 6, 7, 8

4.1 Feedback on previous work

When requesting feedback on the previous work, we found that participants from the first panel of police officers and social service staff were not surprised that the children spoke to the robot in a similar manner to how they speak to the human interviewer. The participants explained that children will often talk to puppets in a similar way to how they talk to a person, even if it is obvious that the puppet is being controlled by someone else. To support this comment additional research has shown that puppets have been used to help alleviate stress in child undergoing medical procedures (Cassell & Paul, 1967; Shapiro, 1995). The participants of this panel also noted that the children in the previous interviews had no stresses associated to the questions that they were being asked, stating that the results may have been different if the questions were of a sensitive or stressful nature. This is a fact that we were aware of, however this type of study would need to be conducted by a professional interviewer that has the appropriate experience and expertise in this field, for ethical reasons we would not be able to conduct this type of study ourselves.

Another aspect associated to our previous work that was discussed refers to visible levels of stress from the children being interviewed. The participants of the police panel explained that in court cases, some level of stress or emotion is expected to be seen from the child in order for the case to be taken seriously by the prosecution. If a child appears to be too comfortable and not showing any signs of emotions or stress, this can actually harm the prosecution, because people often have preconceived ideas about how a child should be reacting when being questioned about sensitive issues. This is a factor that we had not previously considered, however this is only likely to become an issue much further in the future, namely if evidence that has been collected by a robotic interviewer was to be used in

249   court proceedings. The participants of the panel went on to say that a disclosure from a child

250   to a robot that could not be used as evidence in court would still be better than no disclosure

251   at all, because if the child is in any immediate danger, measures could be put in place to

252   protect that child.

253   In all three of the panels there were questions about measuring the consistency of

254   information provided by the children in the studies. One participant from the second panel of

255   intermediaries commented that the children in the videos appeared to be more worried about

256   getting the answers right with the adult interviewer than the robotic interviewer. We

257   explained that the consistency of the information that the children provided in both

258   interviews was measured and that no considerable differences were found in the information

259   that the children provided.

260   During the second panel with the intermediaries, we were asked if the eye gaze of the

261   interviewer was controlled or analysed, to which we replied that these aspects had not been

262   measured. The panel members explained that adult eye gaze is a control mechanism and that

263   their staff are trained how to use their eye gaze when working with and interviewing

264   children. The intermediaries explained that using eye gaze appropriately when working with

265   children can make the children much more comfortable. The intermediaries stated that this

266   may account for why the children looked at the robot more than the human interviewer. In

267   addition to this the intermediaries directed us towards literature that suggests that children

268   find it easier to think if adults are not looking at them (Doherty-Sneddon, 2004).

269   The participants of both the second and third panels commented on some of the children

270   appearing to be more comfortable with the robot than the human interviewer. A participant

271   of the third panel noted that there was a "massive difference" in the behaviour of a girl with

272   autism between the robot and the human, stating that the girl seemed much more relaxed and

273   interested with the robot, and that "the difference is tangible". A participant of the second

274   panel stated that the same girl in the video appeared to be more open with the robot than the

275   human interviewer, and that her head is tilted down more whilst talking to the human

276   interviewer. Participants from both panels suggested that a qualitative analysis approach

277   would be better suited for this research, and that perhaps a structured observation would be

278   the best means of capturing the information.

279   An aspect of the previous studies commented on by the second and third panels were the

280   suitability of the interview arrangement. Both panels of participants believed that the

281   interview arrangement could be improved if the child and interviewer were not directly

282   facing each other, stating that it may be better to sit slightly at an angle so eye contact is not

283   forced as eye contact can adversely affect a child's ability to think (Doherty-Sneddon, 2004).

284   Several examples of this were given in both of the sessions. The paediatric nurse

285   participating in the third panel stated that when working with older children it is sometimes

286   better to sit near the child and give them gentle encouragement to talk rather than sitting

287   directly opposite the child, because sitting face to face can be seen as very confrontational

288   and possibly a bit scary for the child. She also noted that in a doctor's surgery the patient is

289   sitting side to side with the doctor rather than face to face, and patient comfort is possibly a

290   reason for this. Another example given by the paediatric nurse was from personal experience

291   of working with children who missed education because of mental health problems. She

292   stated that sometimes the best conversations with those children were in the car where there

293   is no eye contact, and that this lack of eye contact may have been a contributing factor. The

294   participants from the intermediary panel stated that they would never attempt to talk to a

295   child with special needs face on, and that they would usually sit side on. The participants of

296   the second panel believed that it would be better to have a comparison of the robot and a

297   skilled professional conducting the interviews with children and to have a side by side

298   arrangement rather than a face on arrangement with the child.

299   The intermediaries explained that the criminal justice system tries to establish if the child is

300   a competent witness, however the intermediaries argue that it is impossible to answer that

301   question unless the competence of the adult conducting the interview is known. The

302   intermediaries explained that the competence does not exist in the child, it exists as an

303   exchange. For example, if an interview with a 2 year old is conducted well, the evidence that

304   can be obtained will be very good. In contrast, if an interview with a 10 year old is

305   conducted poorly, the evidence obtained will be very poor. The intermediaries stated that a

306   RMI approach may be useful if the child's competence is dependent upon the adult's

307   specific behaviour of not appearing to show any emotions or visually reacting to what is

308   being said.

309   **4.2 Would experts use this system and where do the main benefits lie?**

310   The participants of all three panels considered that the system would not be useful as it

311   currently stands because it is too restrictive. Each panel clearly stated that the system would

312   need to be far more flexible and have the ability to respond to any question because the

313   nature of the interviews with children is often unpredictable. The participants stated that if

314   the flexibility of the system were to be improved, using the system could be considered.

315   Participants of the police panel in particular considered that the RMI system was unlikely to

316   be used with typically developing children because the techniques used with typically

317   developing children are well established, therefore efforts should be focused on working

318   with children that have special needs such as autism. With those children professionals

319   would be interested in using the system due to their varied development and complex

320   conditions. In fact, the general consensus across all three panels was that the majority of the

321   potential benefits of a RMI approach would lie with children that have special needs, since

322   very well documented approaches and successful methods for interviewing typically

323   developing children already exist (Aldridge & Wood, 1998; UK Government, 2011; UK

324   Government., 2007; Poole & Lamb, 1998). However, interviewing children with special

325   needs is much more difficult and as a result prosecution and conviction rates for cases

326   involving a witness with special needs are much lower (McCarthy & Thompson, 1997; Turk

327   & Brown, 1993), despite children with special needs being up to 4 times more likely to be a

328   victim of abuse (Jones et al., 2012). These facts, coupled with the research suggesting that

329   children with special needs respond well to robots, presents a strong case for focusing future

330   investigations of RMI on children with special needs.

331   The participants of the intermediaries' panel had a more refined view of the system and

332   believed that the system would have a relatively small niche being suitable for children with

333   autism or the most disturbed children for whom any human interaction is difficult. For

334   example, KASPAR may be particularly useful when interviewing children that have been

335   sexually abused because it is not the same as talking to a person, and some of the most

336   traumatised children may reveal more to a robot than a human. The intermediaries' generally

337   had a much higher expectation of technology and stated that an autonomous system would

338   be much more useful to them, quoting systems such as Siri on the Apple iPhone. However,

339   currently such systems would not be suitable for conducting interviews of a sensitive nature

340   with children. Interviewing children about sensitive or emotionally provocative events is a

341 demanding task that requires specialist knowledge and skills, along with a thorough

342 understanding of the relevant background to a case. Computers and robots currently lack

343 human-level cognitive and emotional abilities to perform such tasks and are therefore

344 unsuitable for this task in an autonomous role.

345 The healthcare expert in the interdisciplinary panel stated that the system may be useful in a

346 children's hospice to talk to the children about their illness. She explained that the system

347 would have an advantage over a human because it would not appear to get upset when

348 talking about something distressing. In this context the robot would be used over a sustained

349 period to develop a relationship with the child, and further studies would need to be

350 conducted to establish how effective such a robot would be able to fulfil such a role, but it

351 may provide the child with a useful outlet to talk about their illnesses. The panel member

352 gave the example of a child who knew she was terminally ill but did not want to talk about

353 her illness because of the emotional upset it causes her parents. There were very few

354 contexts where the girl would be able to talk about her illness and a robot such as KASPAR

355 could act as a useful intermediary for this type of situation because the robot would not get

356 upset. This potential application of robots and RMI was something that had not been

357 considered by the research team previously.

358 **4.3 Potential complications and advantages of Robot-Mediated Interviews**

359 As with any system or approach there are potential advantages and pitfalls associated with

360 using them. There are some specific advantages and pitfalls to using a robot in an interview.

361 One of the most obvious advantages that all three panels stated was the robot's ability to be

362 calm, predictable and simple in its responses. KASPAR does not have preconceptions and

363 could listen with an open mind, not emitting social cues or signals. The participants of the

364   intermediaries' panel in particular noted that the robot's lack of complex body language and

365   ability to "not mind" may be an advantage, as that is something that interviewers find very

366   hard. KASPAR could be good at "not getting upset", and not emit the small signs of anxiety

367   or distress which some children detect. The participants stated that children often notice if

368   someone is really shocked or not and they will often detect if someone is faking or trying to

369   suppress their feelings. All three of the panels considered that the robot's lack of body

370   language and emotional reaction could be both an advantage and a disadvantage, depending

371   on the child because each child is different.

372   Another potential advantage mentioned by the intermediaries' panel was that since

373   KASPAR is not human, the children may not assume that the robot has any expectations of

374   the answers the children give. The intermediaries stated that children sometimes think that

375   the person asking them questions already have the answer in their head, and that there is a

376   right and wrong answer. Building on this, the participants of the police panel raised a point

377   about the risk of the children slipping into a fantasy type scenario when using interview aids.

378   The participants explained that one of the difficulties sometimes experienced whilst using

379   props or aids is that it can encourage the children to treat the interview like a playtime

380   fantasy type scenario. In a fantasy world it would be acceptable for the children to fabricate

381   events and fantasise which would obviously present a problem when a child is giving

382   evidence. KASPAR could potentially address this problem because it has a human-like

383   appearance, however, talking to KASPAR would need to be just as serious and as real as

384   talking to a person. The point raised by the police panel would also indicate that KASPAR

385   may potentially be a more appropriate robot than cartoon-like or animal-like robots. Because

386   KASPAR has a simplified, but realistic human-like appearance the children may be less

387 likely to slip into a fantasy type scenario. Note, results from quantitative and qualitative

388 analysis of our three separate RMI studies on non-sensitive topics, including fifty children in

389 total, showed that children interacted with the robot in a similar manner to how they did with

390 a human interviewer in terms of the information they provided (Wood, Dautenhahn, et al.,

391 2013a, 2013b; Wood, Dautenhahn, Rainer, et al., 2013). These results are encouraging,

392 however, future research needs to investigate whether the results also hold for real-life RMI

393 interviews with children conducted by expert users on sensitive topics.

394 The participants of the police panel suggested that a robotic interviewer may have a potential

395 unforeseen advantage with regards to performing interviews in a more fluid, uninterrupted

396 form. According to the participants of the police panel, currently, as the UK rules stand, if a

397 member of the investigation team thinks of a useful question to ask the child while an

398 interview is taking place (this could even be the technical camera operator), the child must

399 be asked that question to give them the opportunity to disclose. The participants said that

400 this sometimes results in pieces of paper being slid under the door of the interview room by

401 other officers who are monitoring the interview, which can be very distracting to the child

402 and can sometimes interrupt the interview. KASPAR could address this problem as a team

403 of officers could control the robot remotely and would be able to offer the child a seamless

404 interview with no such interruptions.

405 **4.4 Aesthetics of the robot**

406 Some feedback from the panels related to the visual and audible aesthetics of the system. It

407 was noted by the police panel that the robot's proportions and clothing could be improved.

408 The participants of the police panel stated that KASPAR appears to have a full sized male

409 head on a child's body and this could be interpreted as an adult trying to act like a younger

410   person, see Figure 4.1. The panel members explained that this could present a problem

411   because individuals that abuse children often try to present themselves in a childlike manner.

412   The participants of the panel felt that the neither adult nor child look of the robot could be

413   confusing to a child, or could even be problematic if the child had been abused by an adult

414   trying to portray the image of a child. This is an important aspect that will need further

415   consideration when choosing robots for RMI applications. However, it is also important to

416   take into account children's view of the robot. The KASPAR robot has been used with

417   hundreds of children since 2006 and its appearance has not presented a problem to children

418   in the past. It is possible that the adult participants of this panel had some preconceptions

419   about how children would respond to a robot with a particular appearance. More recent

420   versions of KASPAR are more proportionate, partially addressing this concern. The

421   concerns of an adult trying to impersonate a child were also extended to include the

422   aesthetics of KASPAR's voice. The participants commented that KASPAR's voice was not

423   very child-like and it would be better to have a more child-like voice that was slightly

424   robotic to help maintain the impression of the robot. Despite the points raised by the

425   participants that need attention, the general consensus about having a robot with a simple

426   neutral face and minimal emotional expressions was positive. All of the feedback gathered

427   relating to areas for improvement are addressable and will be considered in future

428   implementations of the robot. The key principle of a humanoid robot with a simplified but

429   realistic human-like face interviewing children seemed to be embraced by the majority of

430   the participants.

431

432   Figure 4.1. KASPAR interviewing child

433

4.5 Interface and operation of the robot

435   The overall opinions from all three panels of what would be required for a RMI system to be

436   useful and usable in a real world setting were very similar. Participants agreed that the

437   interface, as presented at the time of the panel meetings, would not be useful to experts

438   working with children because of its lack of flexibility. All participants maintained that the

439   system would need to be more flexible, with freedom to respond to and ask questions

440   spontaneously rather than in a scripted manner. Interviews with children, particularly police

441   interviews, are often very spontaneous in nature and the direction of the interviews is often

442   unknown and unpredictable. A participant from the police panel stated: "No two interviews

443   are the same, you try what you think will work and if it doesn't you will use your experience

444   and try another approach". All three panels came to the same conclusion that the most

445   effective means of increasing the flexibility would be to have a direct link to the robot's

446   voice where the interviewer's voice would be converted and spoken by the robot in the

447   remote location. The participants of the intermediaries' panel were more interested in having

448   an automated system. However, when the limitations of current technology were explained

449   to them, they felt that a direct voice conversion option would be the next best option. With

450 regards to automation, the participants of the three panels believed that some automation

451 would be useful for behaviours such as blinking, so that the interviewer could focus on

452 interviewing the child rather than controlling the robot's movements. The participants of the

453 panels indicated that the robot's body language is not very important and should be kept to a

454 minimum. In all of the panels it was commented that too much body language could be

455 distracting to the child. In addition to this, research suggests that inappropriate body

456 language can actively mislead witnesses in interviews (Gurney, et al., 2013). Having a robot

457 whose gestures can explicitly be controlled could address this problem. The three panels also

458 stated that the system must be reliable, because an unreliable system would cause the

459 interviewer to lose confidence and adversely affect any interview. The list of

460 features/specifications that the panels felt were most important can be seen in Table 4.2.

Table 4.2: The user panels ranked the importance of the features they would require from a Robot-Mediated Interviewing system and stated their reasons

Priority	Feature	Reasoning
1	Reliability	The system must be reliable and work every time because of the particularly sensitive nature of the work being conducted.
2	Flexibility – Direct speech interface	The system needs to be flexible to follow any avenue of questioning as the path of questioning is often unknown. A direct speech interface that allows the interviewer to respond to any unexpected line of questioning would likely be the most effective means of achieving this.
3	Usability	The system must be easy to use and allow the interviewer to focus on interviewing the child rather than operating the system. Some level of automation may need to be employed to achieve this.
4	Minimal body language	The system should use a minimalistic use of body language as this may distract the children.
5	Human-like appearance	The robot should have a human-like appearance as this will reduce the likelihood of the children slipping into a fantasy type play scenario.
6	Visual and audible consistency	The robot must look and sound like what it is trying to represent because inconsistencies in visual or audible appearances could be a confusing to a child, or actively problematic if the child had been abused by an adult trying to portray the image of a child.

461 **5 Conclusions**

462 **5.1 Summary**

463 In this article we report findings from an exploratory study comprising a series of panels

464 with potential users of a robot in a RMI setting. The panels that we conducted generated

465 many different ideas, but there was an overall general consensus of opinion about what

466 features the system must possess and what children the system would most likely be useful

467 for. All three panels shared the view that the flexibility of the system would need to be

468 improved in order to make this system useful in a real world setting. Further to this, the most

469 common recommendation by the participants in all three panels was to implement a direct

470 speech interface that converts the voice of the interviewer allowing the interviewer to

471 respond to any unexpected and spontaneous path that an interview may take. The

472 participants of two panels generally had a very positive view of this approach and could see

473 a number of settings where this system could be used, including a system for child

474 protection, as well as medical usage (e.g. used to be in hospitals) for asking children where it

475 hurts, as it is sometimes difficult to get children to respond. The common view shared by all

476 of the panels was that the system would be best suited to working with children that have

477 special needs. The participants in the police panel in particular stated that they would only

478 be interested in using such a system with children that have special needs because they

479 believed that this is where the greatest potential for the system lies, and this is often where

480 additional measures need to be taken to help the child. This is consistent with the guidance

481 of the ABE which states "It is important to find out what impact the child's condition is

482 likely to have on the interview or on the communication process, and to adopt a positive

483 approach that focuses on the child's abilities when trying to find out how they can be helped

484   to communicate." (UK Government, 2011, pp. 172). In addition to this there were also

485   suggestions by the participants of the third panel that the system may appeal to children's

486   mental health workers or clinical psychologists, as they may find the system useful for

487   counselling.

488   The panels all stated that as the system currently stands, it would not be usable in a real

489   world setting due to the limited scripted nature of the system. However, the panels stated

490   that if the flexibility of the system were to be improved, this approach may be particularly

491   useful in cases involving children with special needs and communication difficulties. The

492   participants of the police panel did however express doubts about the legal acceptability of

493   evidence acquired by the robot and stated that this could prove problematic in a court of law,

494   and that this would need to be investigated in more detail before they could rely on such an

495   approach. It is possible that one test case would need to be tried first to establish whether

496   this approach could be used to pave the way for future legal cases.

497   One of the key areas that the participants of the third panel emphasised in particular was the

498   importance of usability, reliability and the need for training. The participants explained that

499   guidelines would need to be developed to establish which groups of children this approach

500   would be best suited to (i.e. age range). It was also stated that a training program would need

501   to be developed to show users how to fully utilise the system. The participants stated that in

502   some cases it would be difficult to tell how a child will respond until you have tried it. The

503   most important aspect of the system from the participants' perspectives was the reliability of

504   the system, stating that the system should be robust, as the professionals using the system

505   would need to have confidence in the system, and that it should be easy to operate.

506 **5.2 Supporting information on suggested target group**

507 The participants' view that the system should be targeted at children with special needs and

508 communication difficulties, is supported by evidence that suggests that children with a

509 disability are more likely to be a victim of abuse than a child without a disability. A

510 systematic review of 17 papers and concluded that children with a disability are up to four

511 times more likely to be a victim of abuse than children without disabilities (Jones, et al.,

512 2012), however, the number of cases that result in prosecution is relatively low (McCarthy

513 & Thompson, 1997; Turk & Brown, 1993). Interviewing children with special needs can be

514 very difficult, particularly when talking about a sensitive or emotionally provocative topic or

515 event, because children who cannot communicate well often will not be believed (Mencap,

516 1999). The ABE suggests that when interviewing children with special needs or

517 communication difficulties, the interviewer(s) should seek advice from a specialist who is

518 familiar with the specific procedures for working with children affected by a disability or

519 communication difficulties (UK Government, 2011, pp. 172). Because children affected by

520 disabilities can have difficulties communicating, sometimes props and intermediaries are

521 used to help facilitate communication (UK Government, 2011, pp. 89). Props may be used

522 for a number of reasons including, the assessment of a child's language or understanding, to

523 keep a child calm or settled, to support the recall of events, or to enable a child to give an

524 account of events. Using props must be approached with caution as there are risks and

525 pitfalls associated to using props (UK Government, 2011, pp. 89). The risks associated with

526 using props include: potential legal challenges, distortions or inaccuracies (mostly associated

527 with dolls), the potential to stimulate play or fantasy (associated with teddies or animals),

528 and the risk of upset to the carer or child from explicit use of dolls or drawings. Nevertheless,

529   when used appropriately props can be useful tools for interviewing when common

530   techniques are proving ineffective. The research on RMIs is working on the basis that robots

531   such as KASPAR could effectively be used as a prop similar to the other props mentioned in

532   the ABE.

533   **5.3 Requirements for a Robot-Mediated Interviewing system**

534   The feedback gathered from all three panels indicated that a RMI approach would be

535   considered by various professionals provided certain requirements were met which answered

536   our research question: "RQ-1: Do experts working with children think that a Robot-

537   Mediated Interview approach could be useful in their field?" and "RQ-2: What would

538   experts working with children require from a Robot-Mediated Interviewing system?". The

539   most important factor was reliability as users would need to have confidence in the system

540   being stable. The two most important features to the potential users of the system were

541   flexibility (in terms of a direct speech interface to talk via the robot) and ease of use. Further

542   to this additional criteria were also outlined. From a usability perspective it was suggested

543   that some autonomous behaviours such as blinking could be implemented to enable the

544   interviewer to focus on the task of interviewing the child rather than operating the robot. It

545   was also suggested that a small selection of gestures that could be activated by a visual

546   Graphical User Interface may be useful. Aside from the requirements from the interviewer's

547   perspective, the participants also suggested some requirements from the children's

548   perspective. The panels believed that the human appearance of KASPAR was a benefit as

549   the children would be less likely to slip into a fantasy play type scenario. However, they

550   believed that the robot must look and sound like what it is trying to represent. In the case of

551   a childlike robot, the robot must physically look similar to a child in terms or proportions, be

552   dressed like a child, and have a childlike voice. This is because inconsistencies in visual or

553   audible appearances could be a confusing to a child, or actively problematic if the child had

554   been abused by an adult trying to portray the image of a child. Further to these requirements

555   it was also suggested that a sufficient training program would need to be implemented in

556   order to ensure that the professionals using the system could maximize its potential. With

557   regards to which children, the participants felt the system would be best suited to children

558   with special needs. In addition to this there were a number of other suggestions that had not

559   been considered by the research team, in particular a potential application area involving

560   children with serious illnesses who find it difficult to talk to people about their illness

561   because of the upset that it causes people.

562   **6 Limitations and future work**

563   The feedback gathered in the panels was useful for outlining a set of requirements for a RMI

564   system. It would have been ideal to complete several cycles of feedback, implementation

565   and testing to compile a thorough set of requirements for RMI. Physical testing of a system

566   always highlights issues that sometimes go unnoticed in a theoretical walk through of a

567   system. In addition to this it would have been desirable to perform a thematic analysis

568   (Braun & Clarke, 2006) of the data collected from the user panels and examine each of the

569   group dynamics in more detail. Upon defining a more detailed set of requirements, we plan

570   to implement those requirements and arrange for an expert interviewer to evaluate whether

571   this is an approach they consider to be beneficial to expert interviewers in general. Testing

572   the system with potential users is a crucial step in establishing if this is an approach that will

573   work in a real world situation and genuinely benefit professional interviewers. In addition to

574   this, further consideration needs to be given to the ethical implications of using a RMI

575 system with children. It could be argued that using a RMI with a child is deceptive in nature.

576 However, if RMI helps to protect a child from harm would this be acceptable as it would be

577 for the greater good? These ethical aspects of RMI need much more consideration in the

578 future.

579 **Acknowledgments**

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