1  **An Economic Evaluation of the impact of using Rapport-Based**

2  **Interviewing Approaches with Child Sexual Abuse Suspects**

3  Two studies examined whether rapport-based interviewing with CSA suspects

4  provides greater interview yield that could result in overall cost-savings to the

5  investigation. First, multi-level modelling was applied to 35 naturalistic CSA

6  suspect interviews to establish whether rapport-based interviewing techniques

7  increase 'yield'- defined as information of investigative value. The Observing

8  Rapport Based Interviewing Technique (ORBIT coding manual was used to code

9  interviews; it includes an assessment of both interpersonal adaptive and

10  maladaptive rapport-based interviewer engagement as well as motivational

11  interviewing (MI) strategies. The impact of these two strands (interpersonal and

12  MI) on extracting information of investigative value (including strengthening a

13  case for court and safeguarding) were examined. Adaptive interpersonal

14  strategies increased case strengthening and safeguarding yield, with motivational

15  interviewing having the largest impact on safeguarding yield. Both strategies

16  increase the likelihood of gaining additional types of economic yield.

17  Maladaptive interviewer strategies reduced case strengthening and different types

18  of economic yield. In study two, literature-based economic estimates were

19  applied to establish the potential cost benefits from following national ORBIT

20  rapport training. Further training in adaptive and motivational interviewing could

21  contribute cost savings between £19-£78 million (annual unit costs) increasing to

22  £238-£972 million (lifetime costs) for online CSA across England and Wales;

23  and £157-£639 million (annual unit costs) increasing to £2-£8 billion (lifetime

24  costs) for all CSA. Failure to commit training resource to this, or an alternative

25  strategy, could mean the cost burden attributable to maladaptive interviewing

26  (between £1-£6 million for online CSA and £12-£48 million for all CSA) is not

27  successfully averted.

31  **Introduction**

32  Despite low levels of disclosure and conviction rates, estimated at 12% and 17%

respectively (Children's Commissioner for England, 2015), the number of reported cases of child sexual abuse (CSA) creates demanding workloads for policing bodies. Police in England and Wales recorded 73,260 sexual offences against children in the year ending March 2019 (27% rape offences and 12% with an online element; NSPCC, 2020). This is equivalent to one sexual offence against a child recorded every seven minutes, one child rape recorded every 30 minutes, and an internet offence against a child recorded every hour. Historical child sexual abuse (e.g., Hughes & Jonas, 2015) and CSA with an online element (National Society for the Prevention of Cruelty to Children (NSPCC), 2020; Mitchell et al. 2010; Wolak et al. 2011) have also increased. There are additional concerns that the internet has generated new forms of CSA offending with easy access to IIOC, children and other offenders online reinforcing deviant sexual interests (Kloess et al. 2014). Middleton (2009) estimated that one-third of CSA included an online element. In their meta-analysis Seto et al (2011), found up to 55% of IIOC users admitted to a contact sexual offence, while Long et al (2013) found 87% of dual offenders engaged in grooming behaviours both on and offline, and one fifth of IIOC viewers had produced IIOC (via webcams/grooming children to take photographs of themselves). Findings such as these prompted Christie (2018) to argue that IIOC offences, online grooming and offline CSA be treated as one offence type.

The National Crime Agency (2020) estimate there are now 300,000 individuals in the UK who pose a sexual threat to children, either through contact abuse or online. This requires a huge investment of time and resources to tackle the problems. Giles and Alison (2021) calculated that the Child Exploitation and Online Protection Command's estimated national pool of 50,000 IIOC suspects (CEOP, 2013) could have already contributed an economic burden of £97-£445million (incident costs) increasing to £1.2-£5.4bn (lifetime costs for services and victims) through historical contact CSA. If left

58    unattended by targeted police action, historical victims would not be safeguarded and

59    risk re-victimisation, and future contact offences could contribute a further burden of

60    £16-£18.6m (incident costs; £198-£227m lifetime costs). Designated a national threat

61    by the NCA in 2015, the scale of the problem now requires the development of

62    evidence-led, cost-effective investigative techniques.

63    ***Rapport-based Investigative Interviewing with CSA suspects***

64

65    Enhancing effective CSA suspect interviews should help improve outcomes. Suspect

66    interviews represent a critical moment for investigators; to gather evidence against

67    suspects that builds and strengthens cases and crucially, helps achieve safeguarding

68    goals. Alison, and colleagues argued that rapport-based strategies are preferable to high

69    pressure interrogation techniques. Many studies have demonstrated the benefits of the

70    Observing Rapport Based Interviewing Technique (ORBIT) with terrorist suspects and

71    online child sexual abuse suspects (e.g., Alison et al., 2013; Christiansen et al., 2018;

72    Surmon-Bohr et al., 2020). Indeed, surveys with prisoners confirm that interviewees are

73    more responsive to rapport building and non-adversarial strategies (Kebbell et al., 2006;

74    2010; Cleary & Bull 2019).

75        Responsiveness has been defined by Alison and colleagues as, first, the

76    reduction in counter interrogation strategies and disengagement (e.g., aggression,

77    complete silence or 'no comment') and, second, increased yield (information of

78    evidential value). The ORBIT framework consists of three elements. The first two are

79    independent sets of measures: one based on Motivational Interviewing skills (MI; Miller

80    & Rollnick, 2009; 2012) and the other on the Interpersonal Behaviour Circle (IBC;

81    Leary, 1957). In their examination of the ORBIT model, they have found that adaptive

82    interpersonal strategies (which include adaptive means to handle difficult suspect

83 behaviour), coupled with aspects of motivational interviewing (honesty, authenticity

84 and empathy) increased yield. In contrast, maladaptive interpersonal strategies (in

85 which the interviewer exacerbates aggression of increases a commitment to silence or

86 no comments) and behaviours antithetical to MI (dishonesty, leaking judgement and

87 indifference) reduces yield. This reflects the autonomy afforded to the suspect, allowing

88 them to engage with the evidence and topics presented to them during interviews,

89 without undue pressure or manipulation. The goal is to recognise the situation the

90 suspect is in, consider the implications and draw out their feelings and beliefs.

91 *Economic yield linked to suspect interviews*

92

93 Adherence to rapport-based interviewing should have numerous benefits. Firstly,

94 revealed information might present opportunities to safeguard victims, including

95 undisclosed victims, offences, and suspects, thereby reducing the considerable

96 economic costs associated with sexual victimisation (Giles & Alison, 2021). Second, it

97 would reduce workload as long delays with digital forensics to identify additional

98 victims (e.g., Gallagher et al., 2006; Christie et al., 2015; Christie 2018) may be avoided

99 through it producing targeted intelligence. Third, targeted intelligence might also lead to

100 additional corroborating evidence.

101 Corroborating evidence plays a key role in successful legal outcomes (e.g.,

102 Alonzo-Proulx & Cyr, 2017). Offline CSA often takes place in private with few

103 eyewitnesses, with less physical evidence so investigators are often reliant on children's

104 testimony (Walsh et al. 2010). Along with problems associated with children's accounts

105 (e.g., developmental stage, ability to verbalise, memory, impact of grooming, shame

106 and self-blame) there are often further complications owing to pre-existing relationships

107 with suspects meaning victims are reluctant to disclose or cooperate (Gekoski et al.,

108     2016). With the increase in online offences there is the potential for further

109     corroborating evidence (digital evidence or additional victims who can support the

110     victim's testimony), and rapport-based interviewing may help generate such detail and

111     subsequently increase guilty pleas.

112         Walsh et al. (2010) found cases with an increased quantity of different types of

113     supporting evidence were more likely to be convicted and to enter a guilty plea. A

114     guilty plea means that victims do not need to appear in court, which can help to alleviate

115     the associated detrimental impact on victims (e.g., Parsons & Bergin, 2010; Quas &

116     Goodman, 2012; Joleby et al., 2020; Gekoski et al., 2016). Whilst this impact is difficult

117     to monetize, if ORBIT can increase both the quality and quantity of evidence, it may

118     reduce the amount of child victims required to appear in court.

119         Examples of interview yield that could be more directly monetized include

120     information about specific locations and devices (e.g., passwords), information about

121     specific movements of the suspect and other suspects, knowledge of other suspects,

122     plans and devices, culpability for other offenses and knowledge of other victims.

123     Procuring this information would reduce resource requirements elsewhere (data

124     analytics, digital forensic, house to house, victim identification, identification of

125     networks), facilitate safeguarding (disclosed and undisclosed victims), and help to

126     strengthen cases ultimately improving legal outcomes (charging decisions, prosecutions

127     and convictions).


128     *Evaluation of investigative techniques*

129

130     To date, there has been no economic evaluation of suspect interviewing approaches.

131     There have, however, been evaluations that demonstrate the efficacy of other police

132     actions. For example, multi-agency teams improve case outcomes following child

133    abuse; specifically, child abuse assessment centres (Joa & Edelson, 2004) and child

134    advocacy centres (Bracewell, 2018; Herbert & Bromfield, 2016; 2019a; 2019b; Herbert

135    et al., 2018; Nwogu et al., 2015). Rumney et al. (2020) also considered the case

136    outcome benefits associated with police specialist rape investigation units, whilst

137    Cloutier (2020) considered the use of specialized courts for sexual crimes. A number of

138    studies have tested the efficacy of medical forensic examinations in helping to improve

139    case outcomes following sexual violence (e.g. Kjaerulff et al. 2019; La Harpe et al.,

140    2019; Menaker et al. 2017).

141          Limited research has been conducted to examine the investigative, legal and

142    victim outcomes of investigative interviews. The most directly relevant to ORBIT is

143    Kebbell et al (2006), which reported that sex suspects who confessed to offences,

144    perceived their interviewers to have been more ethical and to have displayed more

145    humanity than those who denied offences. Moreover, the use of suspect interviews

146    improves case outcomes (Kelley, 2008), evidence-based interview techniques with

147    children increase charging rates (Pipe et al., 2013), and voice stress analysis elicits

148    disclosures of undetected offences amongst offenders (Sthathis & Marinakis, 2020).

149    However, Sellers & Kebbell (2011) found interviewers' disclosure of evidence against

150    sexual abuse suspects did not impact decisions to confess. Pichler et al. (2020) reported

151    that interview quality with child interviewees (open-ended questions, compliance with

152    best practice, evidential categories sought) was not associated with trial outcomes when

153    controlling for number of victims and corroborative evidence. The strongest predictor of

154    conviction was number of victims.

155          The purpose of the current research is to conduct an evaluation of naturalistic

156    CSA suspect interviews to explore the extent to which adherence to rapport-based

157    methods (specifically the ORBIT framework's adaptive interpersonal behaviour

158     coupled with motivational interviewing) elicit more relevant cost-saving information

159     from suspects. Study 1 tests the extent to which rapport-based interviewing (increased

160     adaptive, and reduced maladaptive, interviewing along with motivational interviewing)

161     leads to suspects revealing increased evidential yield. In study 2 we draw on a

162     systematic review strategy to establish the various cost estimates that could be

163     associated with case strengthening and safeguarding economic yield. We then estimate

164     the potential impact that national ORBIT training could have, in terms of cost savings

165     generated from improving the use of rapport-based approaches along with outlining cost

166     burdens generated from failure to execute rapport-based interviewing effectively. It is

167     important to note that this is not a cost benefit analysis. This paper establishes the

168     potential economic benefit, but in making any decisions on whether to implement the

169     approach, further consideration should be given to the costs of doing so, as well as the

170     risks.

171

172     **Materials and Methods**

173     **Study 1 Multi-level modelling of naturalistic interviews**

174     *Participants*

175     The case files for 25 CSA suspects were drawn upon for this research. Independent

176     coders analysed 35 individual (as some cases contained multiple interviews) interviews

177     across 44 hours, broken down into 176 15-min segments. While the interviewers were

178     not trained in ORBIT, they represented a sample of experienced officers (10+ years in

179     specialist area, with at least PIP 2 or Tier 3 equivalent training) demonstrating a range

180     of adaptive and maladaptive methods. The cases were selected to represent a diverse

181     range of suspects and challenges presented during interview, which included disengaged

182     or no-comment suspects, others denying knowledge of most evidence presented to

183     them, and some that confessed and provided full accounts. They include both contact

184     and IIOC only suspects, female and male suspects, multiple and single offender cases,

185     international and UK based, as well as a diverse range of victims (e.g., contact abuse of

186     children and teenagers, repeat image offences, online grooming, payment for live

187     streaming content). Cases covered a range of forces throughout the UK.

188     *Materials*

189     Two experienced ORBIT coders, worked independently to code each 15 min interview

190     segment according to an ORBIT coding manual. The manual developed by Alison,

191     Alison, Elntib, and Noone (2010) was used to code the behaviour of the participants in

192     the interview. Interviewer behaviour was coded into three elements measuring the

193     following: (i) GMIS - Global Motivational Interviewing Scores, (ii) MIDAS –

194     Motivational Interviewing of Detainees: Assessment of Skills, and (iii) IBC-I -

195     Interpersonal Behaviour Circle: Adaptive and Maladaptive – Interviewer. Suspect

196     behaviour was coded into two variables by measuring: (i) IBC-D - Interpersonal

197     Behaviour Circle: Adaptive and Maladaptive – Detainee, and (ii) IYA - Interview Yield

198     Assessment. Further details can be found in Alison et al. (2013). Uniquely for this study

199     and the CSAE offender sample, the coding framework also included components

200     relating to transition points, denial strategies (adapted from Sykes & Matza, 1957), and

201     economic evaluation measures

202        The first author worked with the coders to identify types of economic yield.

203     Eight variables of economic yield were combined to form a variable, **case**

204     **strengthening** - passwords and pin codes, along with evidence of involvement,

205     usernames on social media, info on victim devices, presence of digital evidence, info on

206     areas/movements, knowledge of other undisclosed devices, and knowledge of other

207     significant people. Six variables of economic yield were combined to form a variable,

208 **safeguarding**; usernames of associates, information about associate devices, knowledge

209 of other undisclosed plans, other suspects, culpability for other offences, knowledge of

210 other victims.

211 We did not have access to legal outcomes for individuals within this data set.

212 Cohen's Kappa (k) was used to measure inter-coder agreement. The analysis

213 indicated moderate to almost perfect agreement between coders with five instances of

214 fair agreement between coders.

215 *Analysis*

216 Two binary dependent variables were created for the analysis. These were (1) '**Case**

217 **strength'**; a score of one was given if in that measurement unit information was given

218 on any of eight case strengthening variables, and (2) '**Safeguarding'**; a score of one

219 was given if in that measurement unit information was given on any of the six

220 safeguarding variables. A third continuous variable 'Total economic yield' was the

221 summed score of all 'case strength' and 'safeguarding' variables elicited from suspects

222 (up to a maximum of 14).

223 As the data consisted of multiple measures nested within the same suspects, this

224 necessitated the use of multi-level general linear modelling (as independence of errors

225 would be violated). We ran a variance components model with 'suspect' as a random

226 intercept and produced an intraclass correlation coefficient (ICC) to ascertain the

227 percentage of variance in each outcome attributable to 'suspect'. The variance

228 components model was also compared to a single level model, to ensure fit of the

229 former was superior (assessed with the $X^2$ difference between models and the Akaike

230 information criterion, AIC).

231 We than ran a series of multi-level logistic regression models with a logit link

232 and a Nelder-Mead optimiser for case strength and outcomes. For 'total economic yield'

233 multi-level Poisson regression with a log link was utilised. Regression coefficients

234 along with odds ratio's (or Relative risk ratio's in the case of the Poisson model) and

235 their 95% confidence intervals were reported. For each outcome four separate models

236 were tested: (1) Overall adaptive, maladaptive and MI skills (2) Each of the global MI

237 skills as the predictors, 3) Each aspect of adaptive interviewing as predictors and, (4)

238 Each aspect of maladaptive interviewing as predictors.

239

240 **Study 2 Economic modelling of rapport-based interviewing**

241 A rapid evidence assessment (see Varker et al., 2015), was undertaken to develop an

242 economic framework to apply to investigative interviews. The aim was to summarize

243 what is known about the cost of CSA investigations and average victim costs for CSA.

244 The review of material followed in the economic tradition; producing a systematic

245 literature review to provide an overview of available evidence from which we make

246 critical decisions about figures in cost estimates.

247 First, we drew on the systematic review produced by Giles & Alison (2021).

248 These authors undertook a systematic literature review in August 2020, searching for

249 relevant material published 2000-2020, that met search terms (cost AND victim AND

250 sex* crime OR rape OR child sex* abuse OR indecent image* OR internet sex* offend*

251 OR online sex* offend OR contact sex offen OR groom* OR chat room off* or

252 solicitation off* OR molest* OR pedo* OR paedo*) and could be found utilising six

253 databases (Cochrane library, PsychINFO, Scopus, Web of Science, NCJRS and

254 PubMed). This was focussed on average victim costs for CSA. To expand upon this and

255 identify resources examining the cost of CSA investigations a PICO framework was

256 developed to establish any economic costs (outcomes) associated with police

257 (population) action (intervention) during CSA investigations along with broader

258 outcomes that could potentially be monetized (e.g., outcomes, including impacts on

259 offending). Economic evaluation research would also be considered (control).

260 ***Search Strategy***

261 Studies would be included if they included economic costs associated with CSA

262 investigations, provided an economic assessment of police actions during CSA

263 investigations, or demonstrated the cost effectiveness of such. Search terms were

264 developed from the PICO ("police*" or "law enforcement") AND ("invest*" OR

265 "interview" OR "enquiry" OR "inquiry" OR "response" OR "evidence" OR "analysis"

266 OR "case manag") AND ("cost" OR "price" OR "value" OR "economic" OR

267 "investment" OR "resources") AND ("sex* crime" OR "sex* offender" OR "sex*

268 offender victim" OR "child sex* abuse" OR "child porn*" OR "indecent image* of

269 children" OR "IIOC" or "internet sex* offend*" OR "online sex* offend" OR "contact

270 sex offen" OR "groom*" OR "chat room off*" or "solicitation off*" OR "molest*" OR

271 "pedo*" OR "paedo*" OR "hebro"). The search covered the period from 2000-2020 and

272 was not limited by language or publication type, or with respect to whether they were

273 published or unpublished. Seven databases were searched in total: PsychINFO, Scopus,

274 WoS, NCJRS, PubMed, econlit and repec. A request for relevant police literature was

275 also disseminated by national policing leads.

276 Following initial searches, there followed de-duplication, review of study titles,

277 application of screening procedures and compilation of target lists for further review.

278 Application of search terms resulted in 4052 items. These were screened by the

279 first author, such that items were excluded based on duplication, or on the basis that the

280 full text did not inform the research question. A short list of 182 items were reviewed.

281 Shortlisted material included a range of police interventions in child sexual abuse and

282    sexual violence cases, including forensic advisors in court & multidisciplinary teams,

283    but the majority were excluded on the basis that economic data was not presented.

284

285    *Cost of CSA investigations*

286    Three studies were retained that provided detailed accounts of the economic costs

287    associated with CSA investigations (Christie et al., 2015; Christie, 2018, Heeks et al.,

288    2018).

289         Costs provided by the Home Office (Heeks et al., 2018) are drawn upon

290    nationally to help estimate the 'disease burden' generated from crime. However, it is

291    important to note that the costs provided are not unit costs to police for each crime

292    recorded. The Home Office uses all crimes (rather than police recorded crimes) to

293    estimate the unit cost for each crime. As such, the unit costs for each rape and other

294    sexual offence will be higher. The total cost to the police by crime type (e.g. rape) is

295    divided by the estimated total number of crimes (including those not reported to the

296    police).

297         Christie et al., (2015) and Christie (2018) worked with UK policing partners to

298    scope out the potential volume of CSA and relatedly, approximate costings for the

299    police response across the UK. Both reports provide a detailed breakdown of potential

300    costs throughout the life cycle of a typical online and offline CSA investigation that

301    could be utilised for subsequent economic analysis. This provides a framework to be

302    used in future research examining the benefits of police investments. As such, we draw

303    upon the detailed costs provided by Christie et al (2015) and Christie (2018) to inform

304    our economic evaluation.

305

306    *Average CSA victim costs*

307

308    Following a systematic review methodology, Giles & Alison (2021) considered Saied-

309    Tessier (2014), Letourneau et al (2018) and Heeks et al (2018) for inclusion in

310    economic analysis given their focus on either child sexual abuse, the full range of costs

311    included and/or focus on the United Kingdom (UK). Saied-Tessier (2014) was further

312    discounted from analysis as unit costs were not available across a range of measures.

313    They argue for the use of Home Office figures (Heeks et al., 2018; UK) to calculate

314    incident costs. An American study (Letourneau et al., 2018) was selected to estimate

315    lifetime costs on victims and society.

316

317    ***Incident costs***

318    To provide a cost per incident, Heeks et al (2,018) calculate the unit cost of rape as

319    £39,360 and other sexual offences as £6,520 in 2015/16. Figures increase to £43,214

320    and £7,158 in 2019 using Bank of England online 'inflation' calculator with inflation

321    averaged at 3.2% a year (Giles & Alison, 2021). These figures are drawn on in the

322    economic proofs provided in study 2.

323    ***Lifetime costs – lower and upper bound estimates***

324    Letourneau et al (2018) provide average lifetime costs for victims of nonfatal child

325    sexual abuse in the USA in 2015. Drawing upon a wider range of measures than Heeks

326    et al (2018) such as education costs, they also draw on the available child sexual abuse

327    literature to establish lifetime effects on health, criminal offending, suicide death and

328    QALY losses. They estimate that the lifetime costs for female victims of nonfatal child

329    sexual abuse is $282,734. Applying HM Revenue & Customs exchange rates $282,734

330    was calculated as £176,850 in 2015, this figure increases to £197,535 in 2019 using

331    Bank of England online 'inflation' calculator with inflation averaged at 2.8% a year.

332    This is used as a lower bound lifetime cost in the economic proofs provided in study 2.

333        Separately, Letourneau et al (2018) estimate quality of life losses as $41,001 for

334    female victims and $38,904 for male victims. Upper bound estimates could therefore

335    include quality of life losses (adjusted to $40,477 to account for 75% of victims being

336    female, see Giles & Alison, 2021). This was calculated as £25,318 in 2015 and

337    increased to £28,279 in 2019 (using the same method). As such, the upper bound

338    estimate of lifetime cost used in study 2 is £225,814.

339    Table 1 provides a detailed breakdown of costs that inform our economic framework,

340    including our rationale for lower and upper bound estimates.

341

342                             Insert Table 1 here

343

344    *Analysis*

345    The economic framework is applied to national crime reports to establish the potential

346    impact we might expect from ORBIT training, moving the interviewer workforce

347    towards predominant use of adaptive and motivational interviewing. This approach also

348    helped to establish the potential cost burden associated with predominant use of

349    maladaptive interviewing. The economic estimates are applied to the most recently

350    published crime figures for online CSA (n=8,807; NSPCC, 2020) and all CSA recorded

351    by police forces in England and Wales (n=73,260; ONS, 2020).

352

353    **Results: Study 1**

354    *Case strengthening*

355    Case strength- is the presence of *any* of the case strength variables (91) vs. absence (81).

356    Case strength is coded as 0/1 with the latter indicting presence.

357    *Variance components*

358    The measurement within case model (AIC= 231.28) was a better fit compared to single

359    level model (AIC=238.86; $X^2$(1)=10.581, p=.001, ICC =.21). This indicated a multi-

360    level model is required.

361

362    *Multi-level models*

363                                    Tables 2-5

364

365    These tables show a one unit increase in adaptive interviewing strategies produce a 35%

366    increase in the likelihood of gaining economic yield that would strengthen cases (Table

367    2). Notably the use of adaptive co-operative strategies appears most effective with a one

368    unit increase here increasing the likelihood of gaining case strength economic yield by

369    55% (Table 3).

370

371    **Safeguarding**

372    Safeguard is the presence of *any* of the safeguarding variables (36) vs absence (136).

373    Safeguard is coded as 0/1 with the latter indicating presence.

374    *Variance components*

375    Measurement within case model (AIC= 174.09 was a better fit compared to single level

376    model (AIC=178.48; $X^2$(1)=6.395, p=.011, ICC =.29). Although the difference was

377    significant the AIC did not indicate a substantial improvement from the single level to

378    multilevel model (AIC difference <5), and wide large CIs generated. We repeated the

379　safeguard analysis using a single level, Penalised likelihood regression analysis (logistic

380　regression using Jeffery's invariant prior).

381
382　Insert Tables 6-9
383
384　A one unit increase in motivational interviewing strategies produced a 12% increase in

385　the likelihood of gaining safeguarding economic yield (Table 6). This is particularly

386　related to the use of evocation; one unit increase here doubles (222%) the likelihood of

387　gaining safeguarding economic yield (Table 9). Adaptive interviewing approaches also

388　play a part. Whilst overall adaptive interviewing was related to increased safeguarding

389　economic yield, it is notable that a one unit increase in passive adaptive interviewing is

390　associated with a 57% increase in the likelihood of gaining safeguarding economic yield

391　(Table 7).

392

393　***Different types of economic yield***

394　Economic data is coded as information not given (0) or given (1) e.g., passwords, other

395　offender names, etc across 14 different categories. A total count of this information

396　(#/14) was computed.

397

398　This count was then analysed with a series of multi-level Poisson regressions.  Fit was

399　compared against alternative models (zero inflated Poisson, negative binomial, zero-

400　inflated negative binomial) with the standard Poisson being the best fit as assessed with

401　AIC values..

402

403　*Variance components.*

404　38.8% of variance in information produced was attributable to the case level, the

405　remaining 61.2% to the unit of measurement. This suggests that the individual is not the

406 most important factor in whether they gave this information or not (i.e., it's not the case

407 that some interviewees just talk and other do not at all, all showed variance in

408 information given across the interview process). The dispersion for all three models was

409 <1.06, meeting Poisson assumptions.

410

411 *Global MI skills.*

412 Evocation had a significant effect on increasing the amount of information given

413 Relative Risk Ratio (RRR)=1.38, 95%CIs =1.10 to 1.74, p=.006. This means that a unit

414 increase in economic yield (one additional type of economic yield) is 38% higher when

415 exposed to a 1 unit increase in evocation. There were no other significant MI skills.

416

417 *Interviewer adaptive*

418 Adaptive cooperative interviewing significantly increased the amount of information

419 given RRR=1.21, 95%CIs =1.03 to 1.44, p=.012 as did adaptive passive RRR=1.23,

420 95%CIs =1.07 to 1.40, p=.003. This means that a unit increase in economic yield (one

421 additional type of economic yield) is 21% higher when exposed to a 1 unit increase in

422 adaptive cooperative interviewing and 23% higher when exposed to a 1 unit increase in

423 adaptive passive interviewing.

424

425 Notably adaptive confrontational had a negative association with information

426 RRR=0.87, 95%CIs =0.77 to 0.98, p=.026. This means that a unit increase in economic

427 yield (one additional type of economic yield) is 13% less likely when exposed to a 1

428 unit increase in adaptive confrontational interviewing.

429

430 *Interviewer maladaptive*

431 Maladaptive passive interviewing had a significant negative effect on information given

432 RRR=0.74, 95%CIs =0.61 to 0.91, p=.004, as did maladaptive confrontational

433 RRR=0.73, 95%CIs =0.65 to 0.94, p=.017.

434

435 This is an interesting observation in respect to passive interviewing, done well (adaptive

436 passive) increases the likelihood of number of different types of economic yield. Done

437 badly (maladaptive passive) reduces the likelihood of number of different types of

438 economic yield, here a 1 unit increase was associated with a 26% reduction in

439 likelihood of gaining an additional type of economic yield. Equally, a 1 unit increase in

440 maladaptive confrontational is associated with 27% reduction in likelihood of gaining

441 an additional type of economic yield.

442

443 **Results: Study 2**

444 *Case strengthening*

445 Adaptive co-operative strategies proved effective in improving the likelihood of gaining

446 case strengthening economic yield. Moving the national workforce from none co-

447 operative strategies to predominant style of interaction (a three point unit increase)

448 could be associated with an 165% increase in likelihood of gaining case strength

449 economic yield. Whilst the initial base line of economic yield was low, this analysis has

450 demonstrated potential benefits associated with increase in adaptive co-operative

451 strategies in a naturalistic setting (i.e., these interviewers were not ORBIT trained). In

452 Table 10 we apply the economic framework provided in Table 1 to project the potential

453 cost savings that could be associated with ORBIT training on a national level,

454 responding to annual reports of online CSA and all CSA in England and Wales.

455

456        Table 10 here

457    Taken together, predominant use of adaptive co-operative strategies could reduce police

458    time (passwords, targeted case building, shorter investigations, reduced court costs

459    through guilty pleas) contributing annual cost savings for police forces across England

460    and Wales; between £1.4 to £5.8 million for online CSA and £12.2 and £48.4 million all

461    CSA.

462    Using the same logic applied to passive maladaptive interviewing (48% reduced

463    likelihood of case strength economic yield), predominant use of passive maladaptive

464    adaptive interviewing could reduce the likelihood of gaining case strength economic

465    yield by 144%. Failure to commit resources to reduce the use of passive maladaptive

466    interviewing could generate a cost burden within the same magnitude as the cost saving

467    established for adaptive co-operative strategies (between £1.4 to £5.8 million for online

468    CSA and £12.2 and £48.4 million all CSA). As cost effective as adaptive interviewing

469    is, maladaptive interviewing could prove equally costly.

470    *Safeguarding*

471    Evocation and passive adaptive interviewing proved effective in improving the

472    likelihood of gaining safeguarding economic yield. Moving the national workforce from

473    no evocation to predominant style of interaction (a three-point unit increase) could

474    mean that interviewers are up to six times more likely to elicit safeguarding economic

475    yield from interviewees. Moving towards predominant use of passive adaptive

476    interviewing would be associated with 171% increased likelihood of gaining

477    safeguarding yield. The initial baseline of safeguarding economic yield was higher than

478    case strengthening, and this analysis has demonstrated further potential benefits

479    associated with increase in evocation and passive adaptive strategies in a naturalistic

480    setting (i.e., these interviewers were not ORBIT trained). In Tables 11-12 we apply the

481 economic framework provided in Table 1 to project the potential cost savings that could

482 be associated with ORBIT training on a national level, responding to annual reports of

483 online CSA and all CSA in England and Wales.

484                                    Insert Tables 11-12 here

485 Taken together, predominant use of passive adaptive interviewing and evocation could

486 reduce potential victim harm (identification of other victims and reductions in

487 reoffending) contributing cost savings for police forces across England and Wales;

488 between £17.8-£71.9 million for online CSA and £146.8-£597.6 million all CSA. These

489 figures are based on unit costs. Cost savings, based on averted lifetime costs on victims

490 increased to between £236.8-£966.2 million for online CSA and £1,97-£8 billion all

491 CSA (without QALY)

492

493 **Discussion**

494 The scale of the CSA problem necessitates the development of evidence-led, cost-

495 effective investigative techniques that facilitate legal outcomes and safeguarding goals.

496 Faced with limited, and competing demand on, resources economic evaluation can help

497 policy makers and law enforcement agencies decide where to allocate limited resources.

498 The hypotheses were that rapport-based suspect interviewing generates economic yield

499 that can a) strengthen cases, and thus potentially save valuable police resources; and b)

500 help generate information about victims and other suspects, thus contributing to

501 safeguarding goals.

502          Drawing on findings from study 1 and study 2 with respect to case

503 strengthening, we found that adaptive co-operative strategies could potentially reduce

504 police time (targeted case building, shorter investigations, and reduced court costs

505 through guilty pleas) contributing annual cost savings for police forces. As cost

506 effective as adaptive interviewing is, our analysis reveals that maladaptive interviewing

507 is equally costly. The economic burden generated through increased use of passive

508 maladaptive strategies was estimated as being equivalent to the estimated cost savings

509 for cooperative adaptive interviewing.

510     In our second set of analyses, we found that predominant use of passive adaptive

511 interviewing and evocation could reduce potential victim harm contributing cost savings

512 across England and Wales; between £17,800 million to £71,858 million for online CSA

513 and £147 million to £598 million all CSA. These figures are based on unit costs. Cost

514 savings, based on averted lifetime costs on victims increased to between £237 million to

515 £966 million for online CSA and £2-£8 billion all CSA (without QALY). Evocation –

516 an MI consistent technique directed at extracting thoughts feelings and beliefs appears

517 to be a central mechanism here in encouraging suspect engagement and, subsequently,

518 information of investigative value. Moving the work force towards consistent use of

519 evocation could increase the likelihood of each trained officer gaining safeguarding

520 information six-fold.

521     In summary, findings from our economic modelling suggest that the total cost

522 savings emerging from adaptive interviewing and motivational interviewing

523 (passwords, case strength and safeguarding) could be between £19 million and £78

524 million for online CSA using unit costs, this increases to £238 million to £972 million

525 taking into account averted lifetime costs on victims. The estimated cost savings from

526 adaptive interviewing and motivational interviewing (passwords, case strength and

527 safeguarding) are estimated to be between £157 million and £639 million for all CSA

528 using unit costs, this increases to £2 billion to £8 billion taking into account averted

529 lifetime costs on victims. The disadvantages of maladaptive interviewing could generate

530 a cost burden on police forces across England and Wales, between £1,417 million to

531 £5,818 million for online CSA, and between £12,200 million and £48,396 million for

532 all CSA.

533     It is important that police forces recognise that the findings from this research

534 (particularly study 1) are based on advantages of naturally occurring rapport-based

535 strategies (along with disadvantages of naturally occurring maladaptive behaviours).

536 This research does not provide a definitive evidence base for the full economic benefits

537 of ORBIT. These interviewers had not been ORBIT trained. As demonstrated in the CT

538 interviewing context (Alison, Plummer & Humann, UNDER REVIEW), the anticipated

539 benefits of an ORBIT trained workforce would be expected to be much higher. Even the

540 limited number of rapport-based strategies that were observed conferred economic

541 advantages.

542     A more detailed example is also useful for academics and practitioners to

543 understand our use of odds ratios in study 2. We shall provide an example based on our

544 findings around evocation. Findings from study 1 demonstrated that interviewers who

545 used evocation (e.g. minimal expression of evocation) were twice more likely to elicit

546 safeguarding yield than those interviewers in the category below them (e.g. no

547 evocation observed). This increase in the likelihood of gaining safeguarding yield is

548 linked to an officer moving one unit increase in their use of evocation (from no use to

549 minimal use, minimal use to moderate use, moderate use to predominant use). Although

550 not technically a linear prediction, the assumption is that the IRR has the same effect at

551 each step. For study 2, we apply the finding of a two-fold increase per unit change to

552 six-fold increase across a three unit change (moving the workforce from no use to

553 predominant style of interaction). So if interviewers can be trained to move from not

554 using evocation to using evocation consistently this *could* have *up to* a six fold increase

555 in the likelihood of them eliciting safeguarding yield from suspects.  This does not

556    guarantee certainty as it is reliant on the baseline expression of evocation prior to

557    training. However, it does suggests that officers encouraged to include even minimal

558    expressions of evocation would be twice more likely to elicit safeguarding yield than

559    officers who do not currently use evocation. Those who use evocation predominantly

560    would be anticipated to be six times more likely to elicit safeguarding yeld than those

561    officers who do not use evocation at all. This is the anticipated improvement modelled

562    from naturally occurring evocation and, as mentioned above, does not directly test the

563    likelihood of gaining safeguarding yield following ORBIT training. The actual increase

564    following ORBIT training may be different (confidence intervals must also be

565    inspected). A note of caution must also be made about extrapolating these predictions. It

566    may be that the biggest increase in odds emerges from moving from no use of evocation

567    to minimal expression rather than from moderate expression to predominant expression.

568    Further investigation would be needed to explore the exact effects of different levels of

569    evocation.

570        Evocation, adaptive cooperative and adaptive passive interviewing were further

571    found to increase the number of different types of economic yield. Conversely, adaptive

572    confrontational, maladaptive passive and maladaptive confrontational reduced the

573    number of different types of economic yield. These results suggest that passive

574    interviewing done well can increase yield, whilst done badly decreases yield.

575    Confrontational interviewing reduces yield whether done in an adaptive or maladaptive

576    way. Given findings from Walsh et al. (2010) that successful legal outcomes are

577    dependent upon amount of corroborative evidence, these findings provide further

578    evidence that rapport-based interviewing could have a direct impact on legal outcomes,

579    potentially helping to reduce the poor rates of attrition and prosecution in CSA offences.

580     The evidence presented in this paper is promising, but on its own should not be

581     used to justify investment in ORBIT. Further work is needed to establish a full cost

582     benefit analysis. We are satisfied that our approach can be used to analyse future

583     benefits. We have sought throughout to provide conservative figures so as to promote

584     confidence in our approach. We have drawn on literature-based estimates, identified

585     lower and upper bound estimates, used official crime reports, assumed one current and

586     one future victim, employ recidivism rates based on apprehended offenders. In addition,

587     we do not include the costs of averted internet offences. This is likely to include

588     children who are sexually abused online, along with IIOC offences. As the literature on

589     online CSA demonstrates, online CSA victims can be expected to experience similar

590     levels of harm experienced by offline CSA victims (Hamilton-Giachritsis et al. 2017;

591     Whittle et al. 2013). Further, the economic harm presented here does not consider

592     impact of attending court for victims or family members, nor the wider impact on

593     family members. These estimates might also be best seen as relating to adult offending

594     as offences involving adolescents may not necessarily be recorded as CSA. Christie

595     (2018) notes that 45% of offences are committed by adolescents. It is likely that costs

596     emerging from adolescent offenders are considerable and that rapport-based

597     interviewing would be equally advantageous with younger offenders.

598     Although conservative, there are limitations with the current study. First, we rely

599     on single studies as the basis of estimates rather than meta-analyses. However, there are

600     limited systematic reviews and meta-analyses available. Our analysis provides 'back-of-

601     the-envelope' calculations to demonstrate the potential cost saving that could emerge

602     from estimated decreases in police time. This is a fairly established approach to

603     demonstrate cost benefits (e.g., Wen et al., 2014) when trying to get a handle on

604     potential costs. Whilst we recognise limitations with this approach, Christie et al. (2015)

605    and Christie (2018) worked with partner forces to establish costs, adding validity to our

606    approach. A sensible way forward would be to seek validation from policing partners

607    for the estimates provided in this research. Second, we cannot rule out the role of other

608    important variables or reverse causality, i.e., variables other than rapport-based

609    interviewing led to economic yield, or that suspects willing to make admissions

610    generated a more positive response from interviewers. Cases involving IIOC suspects

611    may be more likely to lead to a guilty plea as there is a physical record of the abuse. It

612    may also be that cases that suspects who assume strong evidence against them are more

613    likely to make admissions during a suspect interview. To help address these potential

614    problems, the ORBIT research team were clear to make sure where economic yield was

615    revealed as a result of interviewers' asking questions and where it was revealed by

616    suspects' own omission. We conducted economic analysis on economic yield that was

617    revealed following asks. A further quality check would be to assess guilty pleas against

618    the coding framework, i.e., is it the case that interviewers demonstrated rapport-based

619    approaches with co-operative interviews who were likely to confess anyway, or did

620    rapport-based interviewing generate yield and potential confession from recalcitrant

621    interviewees? The coders noted that the use of rapport-based strategies was fairly

622    limited in this naturalistic sample, but where present it was clear this had a positive

623    effect in terms of gaining yield and economic yield. An alternative, beneficial approach,

624    would be to conduct methodological triangulation on the existing data set using a

625    qualitative approach to rule out the influence of additional factors and reverse causality.

626         There are a number of additional limitations with our cost estimates. First, some

627    of our case strengthening estimates were based on the assumption that 50% of cases led

628    to a charging decision and this may run the risk of inflating figures. Further work is

629    needed here to establish whether 50% was a sensible metric or whether we should

630 revise our figures with a smaller number (e.g., 17% as outlined by Children's

631 Commissioner, 2015). Second, our estimates assume that victims disclose their abuse

632 and so use the services making up the bulk of tangible costs. However, as previously

633 mentioned, as few as 12% of CSA victims might be expected to report offences to the

634 police. Third, Heeks et al. (2018) do not specifically identify costs of sexual violence

635 with child victims. As noted by Giles & Alison (2021) this has likely led to cost

636 underestimation but further work examining child related costs would be clearly

637 beneficial. Fourth, the evidence underlying assumptions in Letourneau et al. (2018) is

638 US centric. We attempted to interrogate the equivalent literature base in the UK,

639 drawing upon databases routinely used within Health Economics as well as Psychology

640 but no further references were identified. Fifth, some measures in Letourneau et al are

641 underdeveloped. (e.g. educational impacts are measured using the typical costs of

642 special education and this does not do justice to the profound educational impacts

643 following sexual violence; Bolger, 2016). Sixth, Letourneau et al's (2018) estimates are

644 based on victimization at age 11 years. Further work is needed to explore variation in

645 victim costs as a function of victim age (Fisher et al., 2017). Whilst our review did not

646 reveal recidivism studies (beyond Elliot et al. 2019 which suggested higher recidivism

647 rates than those employed here) future work might consider more recent advancements

648 in recidivism studies (e.g. Hogan & Sribney, 2019; Coulter et al. 2021). Whilst

649 problematic, we do not envisage these issues inflated costs. Rather, with further clarity,

650 we would expect costs to increase.

651      This research has demonstrated the benefits of rapport-based strategies for

652 eliciting economic yield. This knowledge can help interviewers appreciate and

653 understand the potential benefits of rapport-based approaches and disadvantages

654 associated with maladaptive approaches. The use of rapport-based approaches was low

655 across the sample as a whole and interviewers did not routinely push for economic

656 yield. In naturalistic settings, interviewers may be reliant on existing digital evidence to

657 help support reactive interview strategies rather than being proactive in using interview

658 strategies to help gain corroborative evidence. Interviewers would benefit from further

659 knowledge and training about the role and value of rapport building in helping to push

660 for and gain such information. Given the low levels of rapport-based skill in this

661 naturalistic sample, it might also be useful to consider gaining the views of interviewers

662 on rapport-based approaches (e.g., their concerns, any barriers they foresee in

663 implementing such an approach). There may be reluctance to implement rapport-based

664 strategies given the stigma of child sexual abuse offenders. Police officers, as well as

665 police managers and the general public, may implicitly favour punishment and

666 retribution in all phases of the criminal justice system, irrespective of the science and

667 potential value of rapport-based approaches. This may present a barrier to the

668 implementation of evidence-based practise. We might also consider more practical

669 aspect, such as whether ORBIT takes longer to deliver and whether this is perceived as

670 problematic for interviewers (see Py, 2013). In future research, we might also consider

671 whether or not ORBIT is effective in detecting false allegations of CSA and the

672 potential economic implications emerging from this.

673      Drawing on evidence-based policing approaches, this research set out to

674 establish whether rapport-based interviewing of CSA suspects represents an effective

675 use of police resources. Multi-level modelling validated the potential mechanisms by

676 which rapport-based interviewing increases economic yield. Economic modelling

677 demonstrated the potential cost savings attributable to adaptive interviewing and cost

678 burden associated with maladaptive interviewing. Evocation played a key role in

679 eliciting safeguarding-related information from suspects. We anticipate that the costs

680    presented here are conservative, as the analysis was conducted prior to any organised

681    training programme for CSAE investigating officers to improve their use of rapport-

682    based approaches when interviewing.  With investment in training and improvements to

683    interview approaches, the gains would be predicted to increase substantially.

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