BACKGROUND INFORMATION IN CSA INVESTIGATIONS

This is a pre-print of a manuscript accepted for publication in Journal of Police and Criminal Psychology. Please reference the final publication. The final peer reviewed, proofed version might differ from the current document.

The Police Use of Background Information Related to Alleged Victims in Mock Evaluations of Child Sexual Abuse

Alessandro Tadei^{1*}, Pekka Santtila², Jan Antfolk¹

¹ Department of Psychology, Åbo Akademi University, Turku, Finland. Email: atadei@abo.fi (Alessandro Tadei); jantfolk@abo.fi (Jan Antfolk).

² Faculty of Arts and Sciences, New York University (Shanghai), China. Email: pekka.santtila@nyu.edu (Pekka Santtila).

* Corresponding author

Alessandro Tadei, E-mail: atadei@abo.fi. Address: Fabriksgatan 2, 20500, Turku, Finland

Abstract

When statistically related to child sexual abuse (CSA), background information can assist decision-making in investigations of CSA allegations. Here, we studied the use of such background information among Finnish police officers. We analyzed their ability to identify and interpret CSA-related and -unrelated background information both when placed in mock scenarios and when presented as separate variables. We also measured the ability to correctly estimate the base-rate of CSA allegations being true based on such background information. In the context of mock scenarios, officers were better in discarding CSA-unrelated variables than in identifying CSA-related ones. Within-subject performance across different scenarios was, however, not consistent. When information was presented as separate variables, officers tended to incorrectly consider many CSA-unrelated variables as CSA-related. Officers performed well in recognizing whether CSA-related variables increase or decrease CSA risk. Finally, officers were inaccurate in identifying variables that are CSA-related only for boys or only for girls. When asked to estimate the CSA probability of mock scenarios, participants were accurate only in assessing low-probability cases, and this was not associated with the ability to identify CSA-related and -unrelated variables. We conclude that police officers would benefit from more training in using background information and from using available decision-making support tools in the context of investigating CSA allegations.

Keywords: Child Sexual Abuse, Police Investigation, Background Information, Probability Estimation, Evidence.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

The Police Use of Background Information Related to Alleged Victims in Mock Evaluations of Child Sexual Abuse

The decision to press charges in child sexual abuse (CSA) cases depends on the quality and quantity of the available evidence. Herman (2010) divided evidence in forensic CSA evaluations into two groups: psychosocial and non-psychosocial. Non-psychosocial evidence, also referred to as strong evidence, includes medical findings, confessions, or videos and photographs. Psychosocial evidence, often considered soft evidence, can, for example, be children's reports and behaviors, or situations that affect the likelihood of the allegation being true (e.g., parental alienation syndrome; Gardner, 1998; see also O'Donohue, Benuto, & Bennett, 2016). The presence of non-psychosocial evidence is usually enough to press charges, while psychosocial evidence tends to be considered less persuasive (Herman, 2010; Myers, 2005). For example, Walsh, Jones, Cross, and Lippert (2010) have identified four types of evidence that, if present, increase the probability that CSA allegations are prosecuted: a disclosure by the victim, a corroborating witness, a confession by the suspect, or a second report against the suspect. In the absence of stronger evidence, the presence of a corroborating witness was the type of evidence that most increased the probability that charges would be filed. Herman (2010) demonstrated that only 36% of 894 CSA cases included corroborative non-psychosocial evidence¹. In cases considered true by mental health and medical professionals this rose to 54%, suggesting that CSA allegations are often prosecuted based on non-corroborative evidence. It is therefore important that professionals involved in investigations and trials are able to identify and correctly assess the role and importance of psychosocial pieces of evidence in CSA cases.

¹ As in Herman (2010), we will use the term corroborative evidence to indicate non-psychosocial corroborative evidence only, instead that any type of evidence that might support the allegation.

1 **Statistical Use of Background Information**

2 Traditionally, for psychosocial and non-psychosocial evidence to be considered as
3 important during investigations and trial, they both have to be directly related to the CSA
4 allegations. Videos and medical symptoms, as well as children's statements and non-verbal
5 behaviors need to be robustly linked to the CSA event to be admitted as evidence in court.
6 There is a third type of information, that we here call background information, which can
7 potentially play an important role during an investigation, even if it is not directly linked to
8 the CSA allegation and is not admissible as evidence. Examples of such background
9 information include previous experiences of the alleged victim with other crimes, personal
10 relations with relatives and peers that are not involved in the CSA allegation, or the alleged
11 victim's life style, such as smoking or drinking.

12 In statistical terms, whether an alleged case of CSA is true or not, or whether the
13 alleged offender has committed the offence or not, can be considered a classification problem.
14 In other words, the allegation or the suspect needs to be assigned to the right class, that is, a
15 true or false allegation, or whether the suspect is the offender or not. A number of
16 classification techniques are available (e.g., logistic regression, discriminant analysis, K-
17 nearest neighbors, naïve Bayes, classification trees, and others; James, Witten, Hastie, &
18 Tibshirani, 2013), and they have been made accessible to non-statisticians through easy-to-use
19 statistical packages (see, for example, Koul, Becchio, & Cavallo, 2017). Seen from a
20 Bayesian decision-making point of view, background information can be used to estimate the
21 veracity of an allegation, increasing or decreasing the probability of it being true. Using a
22 naïve Bayes classifier, Tadei et al. (2017) identified 42 pieces of background information that
23 predicted whether a CSA allegation was true or false with a high level of accuracy. This
24 classifier, called FICSA (Finnish Investigative Instrument of Child Sexual Abuse), was
25 trained on data regarding over 11 000 children and 903 variables (Ellonen, Fagerlund,
26 Kääriäinen, Peltola, & Sariola, 2013). To calculate the probability of a CSA allegation being

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

1 true or false, FICSA needs that part, if not all, of the 42 pieces of background information
2 identified as statistically related to the CSA risk (25 specific for girls, 14 for boys, 3 common)
3 are collected. For example, FICSA might ask if the child has ever tried to smoke, or ever has
4 been robbed. Being a naïve Bayes classifier, FICSA can successfully integrate several pieces
5 of evidence, also when gathered at different times, and the more questions are answered, the
6 more accurate CSA probability estimation will be. Although these pieces of background
7 information required by FICSA do not constitute actual evidence of CSA and would be likely
8 to be non-admissible during a trial in many jurisdictions, the information could still increase
9 the number of CSA allegations that are correctly solved. The authors suggested that knowing
10 the correct base-line probability of a case being true when psychosocial or background
11 information related to it is considered could help investigators prioritize among open cases to
12 optimize the use of investigative resources (Tadei, Santtila, & Antfolk, n.d.). This could
13 reduce the risk that important pieces of admissible evidence that degrade with time (e.g.,
14 physical symptoms, witnesses, child's memories) are invalidated in cases otherwise likely to
15 be prosecuted (Adams, 2011; Antfolk, Rönholm, Salo, Rantamäki, & Santtila, n.d.; Heger,
16 Ticson, Velasquez, & Bernier, 2002; Pipe, Sutherland, Webster, Jones, & La Rooy, 2004).

17 When applied to forensic evaluations, it has been demonstrated, however, that not only
18 the creation of a classifier (Tadei et al., 2017; Zawoad & Hasan, 2015), but also the
19 interpretation of its results (Fenton & Neil, 2012; Koehler, 2011; Tadei et al., n.d.) can be
20 problematic. When in contrast with their own opinion, expert witnesses and legal
21 professionals tend not to consider the results provided by a statistical tool built on actuarial
22 data (Tadei et al., n.d.). This might affect the correctness of the conclusions drawn by forensic
23 professionals, since it has been demonstrated that various cognitive biases might affect
24 decision making and accuracy also when dealing with statistics, (e.g., defense counsel's
25 fallacy, prosecutor's fallacy; Fenton & Neil, 2012; Henderson, 2002). In sum, background
26 information and classification methods have potential to improve the accuracy of the

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

1 decisions made by legal professionals, but available studies indicate that more training is
2 needed.

3 **Background Information in CSA Research and Investigations**

4 There is a lack of research on the use police make of background information about
5 alleged CSA victims. The few studies that have considered also background information have
6 generally limited this to include only gender, ethnicity, and/or age of the child (Stroud,
7 Martens, & Barker, 2000; Walsh et al., 2010). Interestingly, Stroud, Martens, and Barker
8 (2000) observed how all these three pieces of information, even if not evidence, were
9 statistically related to the probability of a case being referred for criminal prosecution.
10 However, the authors did not specify if it is correct to assume that a particular age range,
11 gender, or ethnicity increases the probability of the alleged abuse being true. In the case this
12 assumption was wrong, the connections between these three variables and CSA could be
13 considered CSA myths. Cromer and Goldsmith (2010) defined CSA myths as false beliefs
14 that may “reflect circumscribed features of perpetrators and victims [and] cause harm through
15 diminishing awareness for CSA and the allocation of resources to prevent CSA and help
16 victims, and/or dissuade victims from disclosing abuse” (p. 619). To our best knowledge,
17 research on CSA myths have not explored if these are common, for example, among police
18 officers. The lack of representativeness of background information is visible in CSA myths
19 research as well. Cromer and Goldsmith (2010) gathered and categorized 119 CSA myths,
20 but, when discussing the beliefs about victim characteristics, they only commented on gender.
21 As far as concerns police officers, they are also subject to cognitive biases and myths as
22 everyone else (Aamodt, 2008; Saunders, 2012). Thus, we can expect that, because of the
23 absence of research on CSA background information, they can hold false beliefs about the
24 relation between these variables and CSA risk.

The Present Study

In the present study, we examined how police use background, non-corroborative, information in evaluations of CSA cases. We also tested if the use of such information was affected by it being contextualized in a scenario, as compared to when considered as individual pieces of information. Finally, we tested if being able to correctly consider all available pieces of valid background information, and correctly exclude information that is not valid, led to more accurate conclusions about an alleged CSA case being true or not.

Because of the lack of research about the connection between CSA and background information, we expected police officers not to be able to distinguish a CSA-related piece of information from an unrelated one, both when inserted in scenarios and when presented as individual pieces of information. We expected instead police officers to be able to interpret CSA-related information in the correct direction, that is, either increasing or decreasing the probability of the CSA allegation being true. Based on previous results (Tadei et al., n.d.), indicating a low accuracy of experts in estimating CSA probability without the help of decision-support tools (e.g. FICSA; Tadei et al., 2017), we expected a low performance from the participants when assessing the probability of CSA in the scenarios we presented them, independently of the performance in the CSA related information selection and interpretation task.

Method

Participants

A total of 135 Finnish police officers participated in the present study. They were recruited through the Police College of Finland. Of the participants, 57% ($n = 77$) completed the online questionnaire in its entirety. We excluded participants only from analyses that required the missing information. Of the entire sample, 75% ($n = 101$) were detectives, the other 25% ($n = 34$) were non-detective officers. On average, participants had worked as police

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

officers for 15 years ($SD = 8$). Of the participants, 62% ($n = 84$) had investigated at least one CSA case, whereas 38% ($n = 51$) had never dealt with a CSA case. Finally, 29% ($n = 39$) of the participants had attended a one-year training in child interviewing.

Ethical Permission

The Institutional Review Board of the Faculty of Arts, Psychology and Theology of Åbo Akademi University considered the ethical implications of the present study and gave permission to the authors to carry it out. Before starting the questionnaire, participants signed an online consent form where policy about anonymity, possibility to withdraw from the study, and the aims of the research were described.

Measures and Procedures

The study consisted of two separate sections: section one (S1) and section two (S2). In S1, participants were presented with four scenarios (see Appendix A), each of them shortly describing the life situation and habits of four different children: *Minna* (14-year-old girl), *Salla* (8-year-old girl), *Petri* (14-year-old boy), and *Mikko* (8-year-old boy). The four scenarios included all possible combinations of gender (girl/boy) and probability of abuse (high/low). Each scenario contained exactly ten pieces of information (variables). Of these, five pieces were statistically unrelated to CSA and five pieces of information were statistically related to CSA. All variables were selected from a pool of approximately 1,000 variables used to study the life of over 11,000 Finnish children and their experience with crime conducted in 2013 (Ellonen et al., 2013). This same pool of variables was used to train FICSA. We defined a variable as CSA-unrelated when the chi-squared test between the variable and the presence or absence of CSA experiences was statistically non-significant and the chi-squared test value was close to zero. We considered a variable CSA-related when the chi-squared test between the variable and CSA was statistically significant *and* the variable was used as a feature in FICSA (Tadei et al., 2017).

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

After each scenario, participants had to report their perceived probability (0-100%) that the child described had been victim of CSA. CSA was defined as the occurrence of one or more experiences ranging from *Receiving a proposal to do anything sexual* to *Sexual penetration* involving a person before age 17, along with at least a 5 year age difference between the victim and the offender (Duodecim, 2013). Furthermore, out of the ten variables in each scenario, they had to list the variables they used to estimate the CSA probability and specify, for each of them, if it increased or decreased the CSA risk.

In S2, participants were presented with a list of 44 variables (see Appendix B). These variables belonged to one of the following categories: CSA-related for both boys and girls ($n = 1$), related only for boys ($n = 5$), related only for girls ($n = 16$), or unrelated to CSA both for boys and girls ($n = 22$). To define a variable as CSA-related or -unrelated, we used the same approach as in S1. None of the 44 variables overlapped with the ones used in the four scenarios in S1. In S2, the variables were distributed unevenly across the four categories. This is because the number of features used by FICSA is not equal for these categories. FICSA uses 25 variables that are related to CSA only for girls, 14 only for boys, and 3 variables that are related to CSA for both girls and boys. For each variable, participants were asked to specify which of the four categories it belonged to, being informed that a variable could belong to only one of the four categories.

Statistical Analyses

Section 1. To evaluate how accurate participants were in estimating the CSA probability in the four scenarios we compared the mean of their answers with the probability calculated by FICSA. For more informative descriptive statistics, since the four means were associated with large standard deviations, we decided to use a bootstrapping procedure with 1000 re-samples and a 95% confidence interval. A one-way ANOVA was used to investigate possible differences in the CSA probability estimates both between the scenarios and when compared with the probabilities calculated by FICSA. Descriptive statistics were used to

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

report how well participants performed in excluding CSA-unrelated variables and in retaining CSA-related variables. We also checked whether the CSA-related variables were interpreted in the correct direction (i.e., increasing or decreasing the CSA probability). Pearson correlation was used to test if a good or bad performance in recognizing CSA-related or -unrelated variables was consistent across all scenarios. Finally, we used Pearson correlation to test if a more correct identification of the CSA-related and –unrelated variables was associated with a more correct estimation of the CSA probability.

Section 2. Descriptive statistics were used to measure how good participants were in choosing the right category for each of the 44 variables listed among CSA-related for both boys and girls, related only for boys, related only for girls, or unrelated to CSA both for boys and for girls.

Results

Accuracy of CSA Probability Estimates

Table 1 shows the average probability estimated by the participants for each scenario, together with standard deviations, 95% confidence intervals, and probability estimated by FICSA.

Table 1

CSA Probability Estimated by Police Officers and by FICSA

Scenario	<i>M</i>	<i>SD</i>	BCa 95%CI	FICSA
1 (girl: low)	41.44	24.78	36.76, 46.62	36.90
2 (girl: high)	41.43	24.24	36.66, 46.13	80.80
3 (boy: high)	24.10	20.30	19.95, 28.65	67.60
4 (boy: low)	24.01	18.94	20.20, 27.80	27.80

Note: The column Scenario also gives details about the gender of the child and about the probability calculated by FICSA that could be either low (<50%) or high (>50%). *M* and *SD* refer to average probability of CSA

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

estimated by participants. BCa 95%CI = Accelerated 95% confidence intervals. FICSA = Probability estimated by the Finnish Investigative Instrument of Child Sexual Abuse.

The descriptive analysis in Table 1 shows how the estimates in all the scenarios are below 50%, indicating a tendency to consider the CSA allegation as unlikely to be true when not supported by corroborative evidence. A one-way ANOVA analysis on the estimates, using the scenarios as factor, showed significant differences between the scenarios ($F(3, 368) = 18.72, p < .001$). However, a *Gabriel's* pairwise post hoc test, chosen because of the small differences in the size of the compared groups (Field, 2013), did not indicate differences between scenarios 1 and 2 and between scenarios 3 and 4 as statistically significant ($p = 1.000$), while all the other contrasts were statistically significant ($p < .001$). These results indicate a gender effect, with the scenarios about girls receiving higher risk estimates than the scenarios about boys. However, the officers do not seem to be sensitive to the differences between scenarios with low and high probabilities of abuse. The comparison between our participants' estimates and the ones from FICSA shows that police officers have been accurate, even if at the limits of the confidence intervals, only in two scenarios out of four. In scenarios 2 and 3, the difference between the two estimates is about 35 points, indicating important misjudgments. We then investigated if the difference between police and FICSA estimates is statistically larger in scenarios 2 and 3, than in scenarios 1 and 4. A one-way ANOVA on the differences between the estimates from our participants and the probabilities calculated by FICSA, using the scenarios as factor, showed significant differences between the scenarios ($F(3, 368) = 58.80, p < .001$). A *Gabriel's* pairwise post hoc test, however, did not identify any statistical difference between scenarios 1 (girl: low) and 4 (boy: low, $p = .13$) and between scenarios 2 (girl: high) and 3 (boy: high, $p = .33$). These results could indicate a tendency among police officers to give low estimates overall when only background information is available, making them accurate for cases with low probability.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

Selection and Interpretation of CSA Related and Unrelated Variables

We next investigated police officers' performance in distinguishing between pieces of background information that have an influence on the CSA probability and ones that are irrelevant. Table 2 shows, per scenario, the average number of irrelevant variables correctly excluded from the CSA evaluation, the average number of CSA related variables used to estimate the CSA probability, the average number of CSA related variables that were used in the correct direction (i.e., increasing or decreasing the CSA probability). For each of these values, the optimal performance would be 5, as five unrelated and five related CSA variables were included in each scenario.

Table 2

Average Number of CSA Unrelated and Related Variables Correctly Identified and Interpreted

Scenario	Unrelated discarded		Related chosen		Related correctly used	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	3.50	1.12	2.08	1.21	1.95	1.25
2	3.24	1.07	1.83	1.29	1.83	1.29
3	3.19	1.19	1.45	1.29	1.20	1.07
4	4.68	0.78	1.47	1.37	1.26	1.13

Note: The maximum performance in each column is 5.

These results show a better performance in discarding irrelevant variables than in retaining relevant ones. These numbers partially confirm our hypothesis about the difficulties to distinguish relevant information from irrelevant ones. The tendency not to consider background information as relevant for an accurate CSA evaluation can explain both discarding irrelevant variables and failing to retain relevant variables. The third column indicates that, when a CSA-related variable was included it was done in the correct direction

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

most of the times (91.7%), hence in line with our hypothesis about the capacity of police officers in understanding if a variable would either increase or decrease the CSA probability.

We studied the correlation between the performances in selecting or excluding the correct variables in the four scenarios. None of the correlations were statistically significant. Moreover, we did not find any statistically significant correlation between the performances in the CSA probability estimation task and the relevant/irrelevant information selection task. The results of the correlations are shown in Table 3.

Table 3

Correlations between CSA Probability Estimation and Relevant/Irrelevant Information Selection Task, Divided per Scenario

Scenario	<i>r</i>	<i>n</i>	<i>p</i>
1	-.12	101	.24
2	.04	94	.71
3	-.17	89	.11
4	-.03	88	.77

With Section 2 of the present study, we investigated if police officers were able to separate CSA-related variables from unrelated variables when presented outside the context of a mock scenario. Table 4 shows a crosstab with the categorization done by police in the rows and the correct categorization on the columns.

Table 4

Crosstab between Police Answers and Correct Categorization of CSA Related and Unrelated Variables

Police answers	Correct answers			
	Unrelated (<i>n</i> = 22)	Rel. only for girls (<i>n</i> = 16)	Rel. only for boys (<i>n</i> = 5)	Rel. for both (<i>n</i> = 1)
Unrelated	49.8	36.3	43.9	23.4

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

Rel. only for girls	2.4	0.8	0.5	2.6
Rel. only for boys	1.3	0.6	0.5	0.0
Rel. for both	46.5	62.3	55.1	74.0
	100.0	100.0	100.0	100.0

Note: All the values are percentages, calculated by column.

Police officers correctly identified 49.8% of the unrelated variables (i.e., in more than 50% of the cases they thought an unrelated variable was related to CSA. As participants used almost only two categories, that is, unrelated and related for both, the percentage of correct identification for the unrelated variables would raise to 51.7%, only slightly better than chance level), 74% of the variables related to CSA for both genders, but only 0.8% of the ones related only for girls, and 0.5% of the ones related only for boys. As shown in Table 4, the variables related to CSA only for boys and only for girls have been interpreted, most of the times, as valid for both genders.

Discussion

In the current study, we aimed to investigate how police officers select and interpret background information in CSA mock evaluations, both when part of scenarios and when observed individually. We also investigated if the correct use of background information leads to better estimation of the CSA risk probability.

Selection and Interpretation of Background Information

When the background variables were contextualized in a scenario, police officers performed better in discarding the CSA-unrelated variables that in taking in consideration the related ones. This can be explained by the fact that participants overall tended to use a small number of variables (on average, 3 out of 10 per scenario) to estimate the CSA probability. On the other hand, police officers performed very well in understanding if a variable, when correctly identified as CSA-related, would have increased or decreased the CSA probability.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

1 When evaluating the police officers' performance in understanding the correct direction of the
2 chosen CSA-related variables, 91.7% overall, we must keep in mind the different baselines of
3 the variables that increase and decrease the CSA probability in each scenario. In the four
4 scenarios, the distribution of the CSA-related variables was uneven, meaning that scenarios 1
5 and 2 had four variables that increased the CSA probability and only one that decreased it,
6 while scenarios 3 and 4 had three variables that increased and two that decreased it. However,
7 even considering that by defining all CSA-related variables as increasing the CSA probability,
8 this would have led to 80% and 60% accuracy, showing that participants performed quite
9 well.

10 When the variables were not contextualized in scenarios, police officers performed
11 well in identifying variables related to CSA for both genders, but worse when the variable
12 was unrelated to CSA, or related only for boys or only for girls. In particular, in more than
13 50% of the times they considered CSA unrelated variables as related. This result goes in the
14 opposite direction compared to when the variables were inside scenarios. This might be due to
15 the fact that, as demonstrated by the low CSA estimates, participants did not consider the
16 CSA risk in the scenarios very likely and so tended to disregard a higher number of variables.
17 When the variables were not part of a scenario, instead, police officers were not influenced by
18 their own opinions about the CSA having occurred or not. Another possible explanation is
19 that the single CSA-related variable presented individually, compared to the ones in the
20 scenarios, simply was more well-known to the police officers. The reversed could be the case
21 for CSA-unrelated variables, with more well-known variables being presented in the scenarios
22 and less known presented separately. Finally, participants almost never considered the
23 possibility that a variable could be related to CSA only for a specific gender. This result
24 indicates the need for a much better training about gender specific CSA risk and protective
25 factors.

1 Estimation of CSA Probability

2 The results show that police officers, when asked to evaluate the CSA probability in
3 scenarios containing only background information, tend to provide low values overall. On one
4 hand, this conservativeness is understandable because of the short length of the scenarios and
5 the complete absence of corroborative evidence. On the other hand, if the conservativeness
6 translates to real allegations, high probability cases risk not to be identified as such. In all the
7 scenarios, on average, they estimated a probability lower than 50%, meaning that they
8 considered it was unlikely that the abuse had actually taken place. As a consequence of
9 consistently estimating low probabilities, police officers were more accurate in evaluating low
10 probability scenarios. We also observed the possible existence of a gender bias, since
11 participants consistently estimated the CSA risk for a boy to be 15% less probable than when
12 a comparable scenario was about a girl. The difference between the CSA prevalence for boys
13 and girls (in Finland 0.7% and 3%, respectively; Tadei et al., 2017) is not large enough to
14 alone explain the difference between genders in the police officers' estimates. Unfortunately,
15 there is a lack of scientific literature about the perception of CSA risk for boys and girls and
16 its accuracy. However, we might hypothesize that, since it is commonly known that most
17 people who commit CSA are males (Faller, 1996; McLeod, 2015), over-simplistic reasoning
18 could lead to the assumption that male sex offenders would abuse girls in almost the totality
19 of cases. Another reason why girls are perceived as at much higher risk than boys could be
20 because the distribution of sexual assaults among adults indicates that women are more likely
21 to be victimized (Breiding et al., 2015; Tjaden & Thoennes, 2000). People, therefore, could
22 tend to transpose the same prevalence to the children. These are possible explanations of the
23 gender bias we identified in the present study, but they should be scientifically investigated to
24 even be considered as plausible.

25 Correlation coefficients close to zero and absence of statistical significance for the
26 association between ability of estimating the CSA probability and selection and interpretation

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

of the CSA related variables indicate a difficulty from police officers to attribute the correct weight to each risk and protective factor and to compute a probability based on these weights. This result is in line with what has been observed in a recent study by Tadei et al. (n.d.), that is, experts from the Finnish CSA investigative units tend to be inaccurate in estimating CSA probability when not assisted by decision-making support tools.

Limitations

To measure how correct participants were in estimating CSA probability, we compared their values with the ones we obtained by running FICSA on the four scenarios and that we considered correct. Even if it has been demonstrated that FICSA has excellent diagnostic validity ($AUC = .88$ for girls and $.97$ for boys; Tadei et al., 2017), there is still the possibility for a scenario to be among the false positives or false negatives. In this case, the police officers' estimations might be right and the FICSA's ones, that here we considered correct, might be wrong. However, we limited this risk basing our analyses on four scenarios rather than only one. Furthermore, the risk of wrong estimates by FICSA is also reduced by our results being in line with previous studies.

Earlier we illustrated the possibility that the complete absence of information about a possible CSA event might have driven the participants towards lower estimates. This is supported by the fact that a CSA allegation where only background information is present would rarely be considered worthy of an investigation. However, a previous study (Tadei et al., n.d.) demonstrated that the presence of information related to the alleged CSA event does not always influence the probability estimated using background information only. In any case, we could not add this type of evidence to our scenarios since FICSA would not take it in consideration, i.e. the probability provided by FICSA would be wrong, hence, we could not evaluate the police officers' performance.

1 **Conclusions**

2 With this study, we demonstrated that police officers partially use the available
3 background information when evaluating CSA allegations. However, the relevance given to
4 these pieces of information seems to be dependent on the police officers' own opinion about
5 the CSA probability. Hence, we highlight the importance of better research and training on
6 the nature and use of background information in CSA cases, with a special focus on the
7 gender specific risk and protective factors. We also suggest a consistent use, during the entire
8 investigation process, of decision-making support tools based on actuarial data to help
9 understanding correctly the probabilistic value of each piece of evidence. Finally, we
10 identified the presence of a gender bias that makes the officers estimate an unjustified much
11 higher CSA risk in the scenarios involving girls. This bias, and the reasons behind it,
12 necessitate a deeper exploration.

13 **References**

- 14 Aamodt, M. G. (2008). Reducing misconceptions and false beliefs in police and criminal
15 psychology. *Criminal Justice and Behavior*, 35(10), 1231–1240.
16 <https://doi.org/10.1177/0093854808321527>
- 17 Adams, J. A. (2011). Medical evaluation of suspected child sexual abuse: 2011 update.
18 *Journal of Child Sexual Abuse*, 20(5), 588–605.
19 <https://doi.org/10.1080/10538712.2011.606107>
- 20 Antfolk, J., Rönholm, M., Salo, B., Rantamäki, S., & Santtila, P. (n.d.). Children's
21 Suggestibility in Interviews – A Meta-analysis of the Effects of Child's Age, Post-Event
22 Delay, Event-Type, and Question-Type.
- 23 Breiding, M. J., Smith, S. G., Basile, K. C., Walters, M. L., Chen, J., & Merrick, M. T.
24 (2015). Prevalence and Characteristics of Sexual Violence, Stalking, and Intimate
25 Partner Violence Victimization—National Intimate Partner and Sexual Violence Survey,

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

- 1 United States, 2011. *American Journal of Public Health*, 105(4), e11–e12.
2 <https://doi.org/10.2105/AJPH.2015.302634>
- 3 Cromer, L. D., & Goldsmith, R. E. (2010). Child Sexual Abuse Myths: Attitudes, Beliefs, and
4 Individual Differences. *Journal of Child Sexual Abuse*, 19(6), 618–647.
5 <https://doi.org/10.1080/10538712.2010.522493>
- 6 Duodecim (the Finnish Medical Society). (2013). Current Care Guidelines: Investigating
7 Suspicions of Child Sexual Abuse. Retrieved from
8 [http://www.kaypahoito.fi/web/kh/suosituksset/suositus;jsessionid=7E3A7E56839CC04A](http://www.kaypahoito.fi/web/kh/suosituksset/suositus;jsessionid=7E3A7E56839CC04A143BED0DA7F6BD97?id=hoi34040)
9 [143BED0DA7F6BD97?id=hoi34040](http://www.kaypahoito.fi/web/kh/suosituksset/suositus;jsessionid=7E3A7E56839CC04A143BED0DA7F6BD97?id=hoi34040)
- 10 Ellonen, N., Fagerlund, M., Kääriäinen, J., Peltola, M., & Sariola, H. (2013). Child Victim
11 Survey 2013 [dataset]. Version 1.0 (2015-03-16). Finnish Social Science Data Archive.
12 Retrieved from <http://urn.fi/urn:nbn:fi:fsd:T-FSD2943>
- 13 Faller, K. C. (1996). A Clinical Sample of Women Who Have Sexually Abused Children.
14 *Journal of Child Sexual Abuse*, 4(3), 13–30. https://doi.org/10.1300/J070v04n03_02
- 15 Fenton, N., & Neil, M. (2012). *Risk Assessment and Decision Analysis with Bayesian*
16 *Networks*. Boca Raton, FL: Taylor and Francis Group.
- 17 Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics*. London: SAGE.
- 18 Gardner, R. A. (1998). *The parental alienation syndrome: A guide for mental health and legal*
19 *professionals* (2nd ed.). Cresskill, NJ: Creative therapeutics.
- 20 Heger, A., Ticson, L., Velasquez, O., & Bernier, R. (2002). Children referred for possible
21 sexual abuse: Medical findings in 2384 children. *Child Abuse and Neglect*, 26(6–7),
22 645–659. [https://doi.org/10.1016/S0145-2134\(02\)00339-3](https://doi.org/10.1016/S0145-2134(02)00339-3)
- 23 Henderson, J. . (2002). The use of DNA statistics in criminal trials. *Forensic Science*
24 *International*, 128(3), 183–186. [https://doi.org/10.1016/S0379-0738\(02\)00198-6](https://doi.org/10.1016/S0379-0738(02)00198-6)
- 25 Herman, S. (2010). The role of corroborative evidence in child sexual abuse evaluations.
26 *Journal of Investigative Psychology and Offender Profiling*, 7(3), 189–212.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

1 <https://doi.org/10.1002/jip.122>

2 James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An Introduction to Statistical*
3 *Learning. An Introduction to Statistical Learning*. New York: Springer.

4 <https://doi.org/10.1007/978-1-4614-7138-7>

5 Koehler, J. J. (2011). Misconceptions about statistics and statistical evidence. In *Handbook of*
6 *trial consulting* (pp. 121–133). Boston, MA: Springer.

7 <https://doi.org/10.1017/CBO9781107415324.004>

8 Koul, A., Becchio, C., & Cavallo, A. (2017). PredPsych: A toolbox for predictive machine
9 learning-based approach in experimental psychology research. *Behavior Research*

10 *Methods*, 1–16. <https://doi.org/10.3758/s13428-017-0987-2>

11 McLeod, D. A. (2015). Female offenders in child sexual abuse cases: A national picture.

12 *Journal of Child Sexual Abuse*, 24(1), 97–114.

13 <https://doi.org/10.1080/10538712.2015.978925>

14 Myers, J. E. (2005). *Myers on evidence in child, domestic, and elder abuse cases*. New York:
15 Aspen Publishers.

16 O'Donohue, W., Benuto, L. T., & Bennett, N. (2016). Examining the validity of parental
17 alienation syndrome. *Journal of Child Custody*, 13(2–3), 113–125.

18 <https://doi.org/10.1080/15379418.2016.1217758>

19 Pipe, M. E., Sutherland, R., Webster, N., Jones, C., & La Rooy, D. (2004). Do early
20 interviews affect children's long-term event recall? *Applied Cognitive Psychology*, 18(7),

21 823–839. <https://doi.org/10.1002/acp.1053>

22 Saunders, C. L. (2012). The truth, the half-truth, and nothing like the truth. *British Journal of*
23 *Criminology*, 52(6), 1152–1171. <https://doi.org/10.1093/bjc/azs036>

24 Stroud, D. D., Martens, S. L., & Barker, J. (2000). Criminal investigation of child sexual
25 abuse: A comparison of cases referred to the prosecutor to those not referred. *Child*

26 *Abuse & Neglect*, 24(5), 689–700.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

- 1 Tadei, A., Pensar, J., Corander, J., Finnilä, K., Santtila, P., & Antfolk, J. (2017). A Bayesian
2 Decision-Support Tool for Child Sexual Abuse Assessment and Investigation. *Sexual*
3 *Abuse: A Journal of Research and Treatment*, 107906321773279.
4 <https://doi.org/10.1177/1079063217732791>
- 5 Tadei, A., Santtila, P., & Antfolk, J. (n.d.). The Usability and Effectiveness of the Finnish
6 Investigative Instrument of Child Sexual Abuse in Mock Evaluations.
- 7 Tjaden, P., & Thoennes, N. (2000). Prevalence and consequences of male to female and
8 female to male intimate partner violence as measured by the national violence against
9 women survey. *Violence Against Women*, 6(2), 142–161. <https://doi.org/0803973233>
- 10 Walsh, W. A., Jones, L. M., Cross, T. P., & Lippert, T. (2010). Prosecuting child sexual
11 abuse: The importance of evidence type. *Crime and Delinquency*, 56(3), 436–454.
12 <https://doi.org/10.1177/0011128708320484>
- 13 Zawoad, S., & Hasan, R. (2015). Digital Forensics in the Age of Big Data: Challenges,
14 Approaches, and Opportunities. In *2015 IEEE 17th International Conference on High*
15 *Performance Computing and Communications, 2015 IEEE 7th International Symposium*
16 *on Cyberspace Safety and Security, and 2015 IEEE 12th International Conference on*
17 *Embedded Software and Systems* (pp. 1320–1325). <https://doi.org/10.1109/HPCC-CSS->
18 ICESS.2015.305

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

1 Appendix A

2 *The four scenarios, translated from Finnish, used in Section 1. The CSA probability estimated*
3 *by FICSA is reported.*

4

5 Scenario 1

6 Minna is a 14-year-old girl. She lives with her father and the father's girlfriend; both of them
7 work in the evening, so they have dinner together with Minna once a week or less. The
8 father's girlfriend, when angry at him, usually slaps him in the face, even in front of Minna.
9 Since Minna is often alone in the evening, she sometimes meets her friends, same age as she,
10 in the main square, usually between 10pm and 12am. Otherwise, she spends her time with the
11 boyfriend, 14 years old as well. They already had sex, even if the first time the boyfriend
12 convinced her under the threat to leave her. She really did not like his behavior, but decided
13 not to tell anyone. She sometimes drinks a glass of wine, or half bottle of beer, taken from
14 home when the adults are not there. Even more in the past 6 months, she would describe
15 herself as easily scared and with quite many fears.

16 FICSA probability: 36.9%

17

18 Scenario 2

19 Salla is an 8-year-old girl. At school, during breaks, it happens that she smokes a cigarette or
20 two, not daily. Maybe is for that that in the last year, on social networks, people are saying
21 nasty things about her. Also, she sometimes gets insulted through text messages. Salla told
22 her best friend, Olga, about these messages, but Olga got angry and blamed her. Salla got very
23 upset for that because she considers herself helpful whenever someone is sad or hurt. Salla
24 does not even receive much support at home, where the father has always insulted her.
25 However, he never pushed or shook her. In her family sexual matters have been always
26 discussed openly. Some form of hearing impairment affects Salla, since she was born.

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

FICSA probability: 80.8%

Scenario 3

Petri is a 14-year-old boy. Lately he has been caught stealing some money from the parents' wallet, and also his classmates complained about missing things, but never accused him directly. When he was young, he lived for a few months in a foster family, due to unspecified parents' difficulties. Anyway, he is currently back to his family. Even if sometimes his parents drink wine during meals, Petri never saw them drunk. He likes organized activities and, in particular, he plays as attacker in the school football team. He defines himself as very persistent, he never stops until he finishes what he is doing. Petri considers himself extremely handsome, maybe because of the number of peers, his age, he had sexual touching experiences with, around 8-9. This, most of the times, happened at the peers' house, where they organized to study together. When explicitly asked, Petri said that he never received any sexual proposal online by unknown people.

FICSA probability: 67.6%

Scenario 4

Mikko is an 8-year-old boy. He lives with the mother, the step-father and with two older sisters, 11 and 12 years old. The relation with the sisters is stormy. They often mock him when they are home alone. Once they even gave Mikko a glass of beer to drink just to bully him about being drunk, even if he drank so little that the effect on him was very light. One month ago, Mikko has been attacked by an older schoolmate who pushed him against the wall just to take his snack and the lucky stone that he always kept in his pocket. Mikko spends every night at home with his family.

FICSA probability: 27.8%

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

Appendix B

List of the 44 variables used in Section 2. The correct category each variable belongs to is specified.

Variable	Valid indicator of CSA?			
	No	Only for girls	Only for boys	For both girls and boys
1. Has anyone threatened to hit you or attack you, without then doing it, in the past 12 months?		x		
2. Has anyone only threatened you with violence before this?		x		
3. Have you told your sister / brother about the most serious incident you were victim of (assault, theft, robbery...) in the past 12 months?	x			
4. How many times someone your age tried to or had intercourse, anal, or oral sex with you?	x			
5. In the past 12 months, has an unknown person asked you to send sexy photos or videos of yourself to him/her on the Internet?		x		
6. If anyone attacked you in the past 12 months, were you choked/assaulted with knife/gun?			x	
7. If you ever have been beaten or assaulted, did you suffer large bruises / major cuts?	x			
8. If you ever have been beaten or assaulted, did you suffer broken bones / teeth?	x			
9. If you ever have been beaten or assaulted, did you suffer internal injuries?	x			
10. If you were harassed on the Internet or by the phone and you told someone, did they encourage you to seek help from authorities?			x	
11. Which gender was the first person your age who tried to or had intercourse, anal or oral sex with you?	x			
12. Have you ever had, or have people of your age attempted to have intercourse or anal or oral sex with you?				x
13. In the past 12 months, you saw or heard that your father has been called names in public	x			
14. In the past 12 months, you saw or heard that your father has been mocked or disparaged in public	x			
15. Has anyone hit you or attacked you in the past 12 months? Here you can also mention offenses that occurred during violent robberies		x		
16. Has anyone hit you or attacked you before this?		x		
17. If you ever have been beaten or assaulted, did you go to the hospital or visit a doctor to have your injuries checked?	x			
18. If you ever have been beaten or assaulted, what was the perpetrator's national origin?	x			
19. In the past 12 months, has an unknown person behaved rudely towards you or used obscene language when you have talked to him/her on the Internet?		x		

BACKGROUND INFORMATION IN CSA INVESTIGATIONS

20. If anyone attacked you in the past 12 months, were you physically injured?			x	
21. If you have been harassed on the internet or by phone, did you tell your sister?	x			
22. If you have been harassed on the internet or by phone, and you told someone, this person advised you not to talk about it to anyone	x			
23. Has anyone stolen something from you without using force in the past 12 months?		x		
24. Has anyone stolen something from you without using force before this?		x		
25. If in the past 12 months anyone broke or ruined any of our things on purpose, how old was the perpetrator?			x	
26. If in the past 12 months a sibling or a peer assaulted you, where did this happen?			x	
27. If you think about the past 6 months, do you gladly share your things with others (food, games, pens etc.)?	x			
28. Have you felt very worried in the past 6 months?		x		
29. In the past 12 months, you saw or heard that your father has been threatened with violence in public	x			
30. Have you ever experienced sexual things that did not involve actual physical touch with someone your age?		x		
31. In the past 12 months, you saw or heard that your mother has been beaten up in public	x			
32. If you were victim of theft, were you under the influence of alcohol or other substances?		x		
33. Were you under the influence of alcohol or other substances the first time that someone your age tried to or had intercourse, anal or oral sex with you?	x			
34. Have you told your mother about the most serious incident (any physical or emotional attack from anyone) in the past 12 months?		x		
35. Has anyone sent you threatening messages by phone in the past 12 months?		x		
36. In the past 12 months, you saw or heard that your father's hair has been pulled by someone at home	x			
37. Have you ever tried drugs (e.g. hashish or ecstasy)?		x		
38. Have you told your teacher about the most serious incident you were victim of (assault, theft, robbery...) in the past 12 months?	x			
39. In the past 12 months, you saw or heard that your sister / brother has been mocked or disparaged in public	x			
40. Do you suffer of visual impairment?	x			
41. Has anyone sent you sexually harassing messages by phone in the past 12 months?		x		
42. If you think about the past 6 months, do you get on better with adults than with people your own age?		x		
43. Do you suffer of a respiratory disease, such as asthma?	x			
44. In the past 12 months, you saw or heard that your father has been beaten up at home	x			