



Article

The Relationship between Suggestibility, Fabrication, Distortion, and Trauma in Suspected Sexually Abused Children

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Abstract: Being a victim of abuse in childhood can lead to the development of trauma-related psychopathology, which could affect the testimony of the child victim. Post-traumatic stress disorder (PTSD) is a factor that can increase both the levels of suggestibility and the production of memory errors, such as confabulations, which can be identified in distortions and fabrications. No studies have analyzed the relationship between suggestibility, fabrications, distortions, and PTSD on samples of children and adolescents suspected of being sexually abused. This study aims to verify in a sample of 221 sexually abused children and adolescents the effect of PTSD, measured by Trauma Symptoms Checklist for Children, in increasing the levels of immediate and delayed suggestibility and the production of fabrications and distortions in immediate and delayed memory tasks, obtained by Gudjonsson Suggestibility Scale 2, controlling age and non-verbal intelligence. Our results show that PTSD increases the levels of immediate and delayed suggestibility, but it has no effect on memory recall in immediate recall tasks. Moreover, PTSD leads to a greater number of distorted and fabricated information inserted in delayed memory. Forensic implications of PTSD consequences on memory tasks and suggestibility levels of sexually abused children are discussed.



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Keywords: suggestibility; child abuse; testify; trauma; PTSD; distortion; fabrication; memory; post-event information

1. Introduction

1.1. Immediate and Delayed Suggestibility

In the forensic context, the testimony of a child who is the suspected victim of sexual abuse requires an accurate evaluation of numerous psychological variables in order to ascertain his/her ability to testify. In particular, identifying the vulnerability of the minor to immediate and delayed suggestibility is very important (Ridley and Gudjonsson 2013; Eisen et al. 2013). Furthermore, as many of the child victims of abuse and maltreatment may be affected by post-traumatic stress disorder (PTSD), it is important to understand how PTSD affects memory processes and if it is associated with greater vulnerability to immediate and delayed suggestibility. The main purpose of this study is focused on assessing the effect of trauma symptoms in increasing immediate and delayed suggestibility, as well as memory errors, such as fabrications and distortions in minors who are suspected victims of sexual abuse.

The concept of immediate suggestibility refers to the individual differences approach (Gudjonsson and Clark 1986) and can be defined as the tendency of a minor to accept leading questions and to change the answers initially given after negative feedback in the immediacy of formal questioning (Gudjonsson and Clark 1986). Gudjonsson (1984, 1987) developed a tool to measure individual differences in immediate suggestibility, named Gudjonsson Suggestibility Scale (GSS 1 and GSS 2).

Delayed suggestibility concerns the tendency to include in the original memory trace of the event misleading information or misinformation, due to previous leading questions (Loftus 1979; Vagni et al. 2015): This concept refers to the experimental paradigm of

Loftus, who extensively studied the “post-event misinformation effect” (Powers et al. 1979; Berkowitz and Loftus 2017). Therefore, delayed suggestibility focuses on the effects of external suggestions on the original memory, in terms of memory errors (Ridley and Gudjonsson 2013).

For many years immediate and delayed suggestibility referred to two different theoretical approaches and two different ways of measurement. Studies that have tried to associate them while maintaining the two different measurement methods have not led to any significant correlations between immediate and delayed suggestibility measured with GSS2 and a misinformation task, respectively (Lee 2004). More recently, some studies (Gudjonsson et al. 2016; Vagni et al. 2015) highlighted a significant association between immediate and delayed suggestibility, both measured with GSS2 (Vagni et al. 2015). Another study (Vagni et al. 2017) has also shown a correlation between the two variables measured by GSS 2. According to Gudjonsson et al. (2016), immediate and delayed suggestibility both appear to be linked to poor source monitoring, but are processed in a different way and by different cognitive processes. In particular, immediate suggestibility may be related to factors, such as acquiescence and compliance (Gudjonsson 2003, 2018) that are activated at the time of the interview, but misleading information may not be incorporated into subsequent recollection over time. In contrast, delayed suggestibility refers to the extent to which the delayed misinformation subsequently is incorporated into the respondent’s memory of the event, with the internalization of false information (Ridley and Gudjonsson 2013).

The literature shows that both memory and suggestibility are influenced by cognitive factors as intelligence, memory, and language (Baxter 1990; Bruck and Melnyk 2004), and socioemotional factors, such as anxiety, self-esteem, compliance, etc. (Goodman et al. 2014). Regarding cognitive factors, an important influencing factor is age, as it influences basic memory development, which in turn affects both memory capacity and suggestibility. With regard to differences in suggestibility between children and adults, it seems that children aged 12 years and over are as accurate in free recall as adults and are not more likely to yield to leading questions (Loftus et al. 1990). According to Gudjonsson and Henry (2003), however, older children seem more vulnerable to negative feedback than adults, with a higher tendency to change (shift) their answers to leading questions (Gudjonsson and Singh 1984; Warren et al. 1991).

With regard to socioemotional factors, exposure to adverse life events and the presence of post-traumatic stress symptoms would seem to predispose to greater vulnerability to suggestions and to misinformation errors. Some studies (Drake et al. 2008; Drake 2010; Drake and Bull 2011; Drake 2014), which have focused on adult samples, show that having experience of potentially traumatic events is related to higher levels of immediate suggestibility. In line with these results, Goodman et al. (2001) have found that also in children, trauma histories tend to be associated with false complaints and greater levels of suggestibility.

Despite the importance of the argument in the forensic context, only few studies have focused on children and adolescents who have experienced maltreatment and/or abuse, and the results are not unanimous. In fact, some studies (Vagni et al. 2015, 2017, 2018; Benedan et al. 2018) that applied Gudjonsson (1984) interrogative suggestibility model showed higher levels of immediate and delayed suggestibility in children and adolescents victims of sexual abuse, maltreatment, or neglect, than in minors not exposed to traumatic experiences. In addition, a study by Vagni et al. (2015) found that witnesses who are suspected victims of sexual abuse exhibit lower memory performance, and that suspected victims of intra-family abuse show greater susceptibility to negative feedback than witnesses who are suspected victims of extra-family abuse. PTSD is not considered in this study, but only the intra- vs. extra-family abuse variable.

On the other hand, other studies, that do not refer to the Gudjonsson model of Interrogative Suggestibility (Gudjonsson 1984), have not found higher levels of suggestibility in child victims of abuse compared to control groups (Goodman et al. 2001; Eisen et al. 2002, 2007; Chae et al. 2011). According to Chae et al. (2011), these results may be explained by

the fact that having experienced abuse does not cause in itself a greater susceptibility to suggestibility, (Eisen et al. 2007; Chae et al. 2011; Porter et al. 2005). However, the presence of post-traumatic stress symptoms would seem to predict greater levels of immediate and delayed suggestibility (Eisen et al. 2007; Chae et al. 2011; Porter et al. 2005).

Regarding this hypothesis, the literature shows that minors with PTSD tend to present high levels of suggestibility and poor and inaccurate performance on memory tasks (Chae et al. 2014; Valentino et al. 2008; Valentino et al. 2009).

1.2. Suggestibility, Distortion, Fabrication, and Trauma

The victimization for sexual abuse during infancy may lead to alternative paths of memory development, altering basic memory processes. This may potentially affect memory performance in child witnesses (Howe et al. 2011; Toth et al. 2011; McWilliams et al. 2014). Goodman et al. (2001) found that maltreated and abused children give less information in free recall, and show poorer accuracy than the control group. Abused children show a greater vulnerability to leading questions and to emotional pressure during suggestive listening (McWilliams et al. 2014). According to McWilliams et al. (2014), the emotional impact of negative experience affects memory processes. Several studies have shown that children with sexual abuse experiences may give excessive attention to negative emotional stimuli and display a lack of attention, deficient memory, or incorrect interpretation of positive stimuli (McWilliams et al. 2014; Alexander et al. 2005; Young and Widom 2014). In other words, sexually abused children may present memory errors even when the traumatic event has no direct impact on memory processes. Such theoretical considerations have important implications in terms of abused children's testimony as their memory may undergo suggestive alterations leading to memory errors, such as distortions and fabrications, in their recollections.

Within the forensic context studying confabulation under social pressure is very important in order to understand how witnesses distort the memory of an event and how to identify the factors intervening in this complex phenomenon. For this reason, studying the relationship between confabulation and suggestibility, as well as other variables that may increase this distortion process, is also important. Confabulation and suggestibility are influenced by similar factors, such as uncertainty and expectations (Gudjonsson 2003). According to Gudjonsson (2017), in order to understand the concept of confabulation, it is important to remember the description proposed by Kopelman (2010) that defines confabulations as "false or inaccurate memories" which may be created entirely or include reconstructions remembered in an altered way. Furthermore, according to the author, confabulations can be distinguished in "spontaneous", which are rarely produced and have an organic origin, and in "provoked confabulation", which represents a natural response to memory failure after prolonged retention intervals (Kopelman 1987). "Provoked confabulation" is fundamental in an interrogation context in Gudjonsson and Clark's model (Gudjonsson and Clark 1986) to explain false confessions and because delayed free recall requested by GSS in order to obtain delayed suggestibility is a form of this type of confabulation (Gudjonsson 2017). According Gudjonsson (2003), confabulation can be defined as "problems in memory processing where people replace gaps in their memory with imaginary experiences that they believe to be true" (p. 364).

In agreement with several studies in which confabulations were measured using the Gudjonsson Suggestibility Scales (Gudjonsson 1997), it is fundamental to define two different types of memory errors: Distortion and fabrication (Gudjonsson and Clare 1995). Distortion is a major change of an existing idea, while fabrication is a new element introduced in a memory gap (Gudjonsson and Clare 1995; Smith and Gudjonsson 1986; Register and Kihlstrom 1986; Tata and Gudjonsson 1990; Clare and Gudjonsson 1993; Clare et al. 1994; Howells and Ward 1994; Sigurdsson et al. 1994). In the Interrogative Suggestibility model, the confabulations are measured by the sum of distortions and fabrications. Among the factors that increase confabulation are oblivion, repeated questioning, and negative feedback. Furthermore, the confabulation process may be influenced by com-

pliance and active imagination (Gudjonsson 2017). Several studies conducted on adults that have analyzed the relationship between confabulation in forensic contexts, memory, and immediate suggestibility measured by Gudjonsson suggestibility scale and several other variables, have obtained mixed results. In most of these studies, fabrication and distortion are analyzed as separate scores (Gudjonsson and Clare 1995; Smith and Gudjonsson 1995; Gudjonsson and Sigurdsson 1995). Only one study (Smith and Gudjonsson 1995), conducted on a forensic adult sample, analyzed delayed fabrications and distortions measured with GSS2 after a week. This study showed that fabrications and distortions were differently related to suggestibility—confirming that these are two different aspects of confabulation: Only fabrications were correlated with suggestibility. This distinction is also confirmed in another study (Gudjonsson and Clare 1995). Distortions and fabrications were not correlated and were associated to different variables. Delayed fabrications were significantly correlated with delayed recall and negative feedback. A study found that IQ was negatively related to confabulation, but positively correlated with suggestibility (Gudjonsson and Sigurdsson 1995), unlike another study conducted on people with intellectual disabilities where no correlation with IQ was found (Gudjonsson and Clare 1995). A more recent study confirmed that confabulation is a predictor of suggestibility and that it is correlated negatively with memory and positively with suggestibility scores (Gudjonsson and Young 2010). Confabulation in the interrogative context has only been studied on adult samples, but there are no studies that have analyzed this phenomenon in children.

Specific studies on PTSD, confabulation, and suggestibility in child witnesses seem to be lacking in the specific literature.

2. Objectives

Suggestibility and trauma of suspected sexually abused children were the main focus of this study. The aim of the study was to verify the effect of trauma symptoms in increasing fabrications, distortions, and immediate and delayed suggestibility. The relationships between intelligence, age, memory, trauma, and suggestibility were also considered. Having lived through a traumatic experience may lead to developing PTSD, which can be associated with a greater number of memory errors, such as the two types of confabulations (fabrications and distortions) and vulnerability during a suggestive interview. It was also investigated whether this effect associated with post-traumatic symptoms depends on age and Intelligence Quotient (IQ).

The present study verified the following hypotheses:

Hypothesis 1. *PTSD shows positive correlations with memory fabrication and immediate and delayed suggestibility.*

Hypothesis 2. *PTSD has effects on fabrication and distortion, and immediate and delayed suggestibility, but not on memory tasks.*

Hypothesis 3. *PTSD leads to an increase in fabrication, distortion, and to immediate and delayed suggestibility in delayed tasks.*

3. Materials and Methods

3.1. Participants

The study involved 221 children and adolescents, 130 females (58.8%) and 91 males aged between 6 and 17 years ($M = 11.94$, $SD = 3.19$) as suspected victims of suspected sexual abuse from several Italian courts.

The ecological sample is made up of children and adolescents who are suspected victims of sexual abuse and who undergo a psychological evaluation to verify their suitable capacity to testify before being heard by the judge. The assessment has been carried out before this hearing in order to ascertain their legal credibility strictly following the indications and methodologies indicated by the psycho-forensic protocols validated in Italy.

The aim of this study is not to verify the event of sexual abuse itself, but to measure the victims' suggestive vulnerability and the presence of PTSD based on a self-report tool.

From a psycho-forensic point of view, as opposed to the clinical one, a minor can be considered a victim of abuse when there is a judgment of conviction of the accused. The data collection of this study took place in the preliminary phase of the trial, that is, even before the children were heard by the judge and before the judge issued a decision. Therefore, the children in the sample must be considered "suspected victims of sexual abuse".

The judgments relating to all the participants of the study are not known, and making distinctions between the real or suspected victims could lead to errors of assessment.

In agreement with the specialist literature (Ridley and Gudjonsson 2013; Hritz et al. 2015), in this study, the following significant variables linked to suggestibility were considered: Intelligence Quotient (IQ), age, and gender.

IQ was measured by a non-verbal test (Raven Matrix; Raven 1954) whose average was 95.71 (SD = 14.03; min = 60; max = 115). Participants who failed to complete all tests, due to comprehension difficulties were excluded from the sample.

3.2. Procedure

The instruments were administered following the same procedure with all the participants and were administered at the first meeting with each child. All of the children were met seven days later to complete the data collection.

The children were asked no questions about their sexual abuse, but they were told that the assessment was ordered by a judge. Three researchers and psychologists carried out the assessment, and they followed the same procedure. The collection of the sample took place over a period of three years.

The court hearing of those children deemed capable of testifying took place only after the completion of a psychological evaluation.

In conducting the study and collecting the data, ethical principles were respected in accordance with Ethical Research involving children.

The immediate and delayed suggestibility were measured by the Gudjonsson Suggestibility Scale 2 (GSS2; Gudjonsson 1997) that requires the participant first to listen to the reading of a short story and then give an immediate recall. Fifty minutes were then left, during which the children were given the other tools in order to measure their IQ and PTSD, both as distracting tasks. After another fifty minutes, the second part of the GSS2 was administered, which consists of a suggestive interview.

The delayed recall of the GSS2 story was requested from the participants after 1 week, following the additional procedure (Vagni et al. 2015; Gudjonsson et al. 2016) used in several studies (Vagni et al. 2017, 2018; Wachi et al. 2019).

According to Gudjonsson (2018) semantic memory may influence participants' responses to the leading questions.

As described in the tools section, the GSS2 includes a short story, 15 leading questions, and 5 neutral questions concerning correct information present in the story. In the present study, those participants who gave more than two wrong answers to the neutral questions were excluded because this could suggest a poor or deficient understanding of the story (wrong answers to the neutral questions: $M = 0.38$; $SD = 0.60$; min-max = 0–2).

The participants who gave more than two errors to the neutral questions at the first interview were associated with a very poor immediate memory and were the youngest children. Such scores could be due to poor attention or poor understanding. In the present study, the variables attention and language comprehension were not controlled, and to avoid errors in hypothesis testing, these participants were not included. Participants who incorrectly modified the answers to neutral questions after negative feedback were included because they contribute to measuring the shift. Obviously, participants who had high yield and shift scores were included (see Table A1 in Appendix A).

All tools were administered individually. The materials were used with the authorization of the parents or guardians of the minors involved, in accordance with the Declaration of Helsinki. The institutional ethics committee approved the procedure

3.3. Instruments

Gudjonsson Suggestibility Scale 2 (GSS2; [Gudjonsson 1997](#)). The GSS2 measures the tendency to interrogative suggestibility, memory tasks, and confabulation (distortion and fabrication). The Italian version of the scale ([Vagni et al. 2015](#); [Gudjonsson et al. 2016](#)) used in this study has good reliability: Yield 1, $\alpha = 0.81$; Yield 2, $\alpha = 0.83$; Shift, $\alpha = 0.71$; and Total Suggestibility, $\alpha = 0.77$ ([Gudjonsson et al. 2016](#)) and has been administered in several studies ([Gudjonsson et al. 2016, 2018](#); [Maiorano and Vagni 2020](#)). An immediate recall of a short story is required, and 20 questions (15 misleading and 5 neutral) are administered after 50 min. Successively all the 20 questions are asked after negative feedback. The scores obtained by the GSS2 are: “Immediate recall”—that is a memory score composed of the total number of elements that are recalled immediately after the reading of the narrative (range score 0–40); “Yield 1”—that is the number of acceptance responses of the leading questions on the first interview (range score 0–15); “Yield 2”—that is the number of suggestions accepted to leading questions after the negative feedback and the repetition of all questions (range score 0–15); “Shift”—that is the numbers of answers changed after negative feedback and which measures the susceptibility to negative criticism (range score 0–20); and “Total Suggestibility”—that is the sum of Yield 1 and Shift and corresponds to immediate suggestibility tendency (range score 0–35).

An additional procedure of GSS2 ([Vagni et al. 2015](#); [Gudjonsson et al. 2016](#)) obtains the measurement of delayed suggestibility. With a second evaluation session administered after a week, the “Delayed suggestibility” and “delayed recall” are collected by asking for the recollection of the short story target of the GSS2. Delayed Recall is calculated on the sum of elements of the target narrative recalled after 1 week. Delayed Suggestibility is calculated on the suggestions or misinformation of the leading question of GSS2 included in the Delayed Recall.

Confabulation is scored in immediate and delayed recall of the GSS story as distortions and fabrications ([Gudjonsson 1997](#); [Clare et al. 1994](#); [Gudjonsson and Clare 1995](#)).

Distortions are the total number of major changed details of an existing element of the story target; Distortions 1 is calculated on immediate recall and distortions 2 on delayed recall.

Fabrications are the total number of a new idea added to the recall and not mentioned in the story target.

Fabrications 1 is calculated on immediate recall and Fabrication 2 on delayed recall.

In this study distortions 2 and fabrications 2 were obtained on delayed recall of the story target after a week ([Smith and Gudjonsson 1995](#)).

Raven Progressive Matrices. This is a widely used tool that evaluates non-verbal intellectual abilities and provides a measure of the participants’ IQ. As recommended in the manual, Colored Progressive Matrices (CPM; [Raven 1984](#); [Belacchi et al. 2008](#)) ($\alpha = 0.94$) was used for children up to the age of 12 years and the Standard Progressive Matrices (SPM; [Raven 1954](#); [Giunti O.S. Organizzazioni Speciali 2008](#)) (KR-20 = 0.91) for children age 12 years and over.

Trauma Symptoms Checklist for Children-A (TSCC-A; [Briere 1996](#); [Di Blasio et al. 2011](#)). This is a self-report tool that measures post-traumatic distress and related psychological symptomatology in subjects aged 8–16. The instrument consists of 44 items that are rated according to their frequency evaluated on a 4-point scale (from 0 = Never to 3 = Almost always). The cutoff for all scales is 65 T points. The questionnaire consists of two control scales, Underresponse (UND) and Hyperresponse (HYP), as well as six clinical scales that evaluate Anxiety (Anx), Depression (Dep), Anger, Post-Traumatic Stress (PTS), Open Dissociation (Dis_A, and Fantasy Dissociation (Dis_F). The PTS scale considered in this study evaluates the presence of trauma-related symptoms, which include: Cognitive

avoidance, numbness, hyper-arousal, nightmares, and intrusive. Scores ≥ 65 T indicate the presence of a clinically relevant PTSD.

In several studies, the TSCC was completed by children younger than 8, including cases of children with a history of abuse (Jonkman et al. 2013; Marc 2016). Briere (1996) reports it may also be utilized with 17 years-olds.

Table A1 shows average scores for each variable.

3.4. Analytics Strategies

A preliminary Pearson's correlation analysis was made in order to estimate the relationship between memory and suggestibility scores, IQ, age, gender, and PTSD. A multivariate analysis of variance (MANOVA) was performed on the dependent measures: Distortion (1 and 2), fabrication (1 and 2) immediate recall, delayed recall, Yield 1, Yield 2, Shift, Total suggestibility, and delayed suggestibility, with gender as a fixed variable and the age, IQ, and PTSD as covariates. The MANOVA showed Between and subject effects for PTSD, age, and gender. Partial eta-squared (η^2) was used to measure effect sizes for MANOVA and univariate ANOVAs. Analyses of variance for repeated measures were conducted to verify the effect of PTSD on reducing details recalled and on increasing fabrication and distortion in a delayed memory task. Analyses of variance for repeated measures were also conducted to verify the effect of PTSD on increasing yield two scores after negative feedback. The models were checked for age and IQ.

4. Results

Pearson's correlation analysis confirmed Hypothesis 1 and showed positive significant correlations of the PTSD with fabrications, and with immediate and delayed suggestibility (Table 1). Additional Pearson's correlation analysis was made between GSS2 scores and memory tasks. The results showed significant negative correlations between immediate GSS2 scores and immediate and delayed recall. Fabrication 2 showed positive correlations with shift and total suggestibility (Table A2).

Table 1. Pearson's correlation between GSS2, post-traumatic stress disorder (PTSD), age, and IQ ($n = 221$).

	PTSD	Age	IQ	Immediate Recall	Delayed Suggestibility
GSS2					
Immediate Recall	−0.045	0.282 ***	0.261 ***	1	0.021
Distortion 1	0.064	0.086	−0.176 **	−0.045	0.151 *
Fabrication 1	0.141 *	0.020	−0.115 *	−0.147 *	0.196 **
Delayed Recall	−0.128 *	0.208 **	0.337 ***	0.799 ***	−0.177 **
Distortion 2	0.234 ***	0.063	−0.110 *	0.034	0.226 **
Fabrication 2	0.283 ***	0.095	−0.171 **	−0.014	0.375 ***
Yield 1	0.148 *	−0.311 ***	−0.170 **	−0.487 ***	0.156 *
Yield2	0.313 ***	−0.280 ***	−0.231 ***	−0.434 ***	0.234 ***
Shift	0.081	−0.064	−0.229 ***	−0.308 ***	0.105
Total Suggestibility	0.143 *	−0.236 ***	−0.246 ***	−0.495 ***	0.163 **
Delayed Suggestibility	0.430 ***	0.072	−0.175 **	0.021	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; GSS2 Gudjonsson Suggestibility Scale 2.

Hypothesis 2 was supported by MANOVA analysis assuming all GSS2 scores as dependent variables and gender as a fixed factor and PTSD, age, and IQ as covariates. The results showed main effects for PTSD (Pillai's value = 0.289, $F = 7.587$, $df (10, 187)$, $p < 0.001$, $\eta^2 = 0.289$), IQ (Pillai's value = 0.221, $F = 5.309$, $df (10, 187)$, $p < 0.001$, $\eta^2 = 0.221$), and age (Pillai's value = 0.200, $F = 4.681$, $df (10, 187)$, $p < 0.001$, $\eta^2 = 0.200$), while gender does not assume significance. The interaction between the variables showed significant small effects for age *PTSD (Pillai's value = 0.103, $F = 2.107$, $df (10, 187)$, $p < 0.05$, $\eta^2 = 0.103$) and IQ *PTSD (Pillai's value = 0.096, $F = 1.948$, $df (10, 187)$, $p < 0.05$, $\eta^2 = 0.096$).

PTSD's between-subject effects were with distortion 2, fabrication 2, Yield 1, Yield 2, and delayed suggestibility (Table 2).

Table 2. Between subjects effects of multivariate analysis of variance (MANOVA) for GSS2, PTSD, age, and IQ ($n = 221$).

Factor	Dependent Variable	Between Subjects Effect		Estimate Parameter
		F	η^2	<i>t</i>
PTSD	Distortion 2	10.939 ***	0.053	3.307 **
	Fabrication 2	16.283 ***	0.077	4.035 ***
	Yield 1	4.258 *	0.021	2.063 *
	Yield 2	21.178 ***	0.098	4.602 ***
	Delayed Suggestibility	44.592 ***	0.185	6.678 ***
Age	Immediate Recall	28.833 ***	0.128	5.370 ***
	Delayed Recall	17.283 ***	0.081	4.157 ***
	Yield 1	33.393 ***	0.146	−5.779 ***
	Yield 2	30.490 ***	0.135	−5.522 ***
	Shift	4.588 *	0.023	−2.142 *
	Total Suggestibility	25.619 ***	0.116	−5.062 ***
IQ	Immediate Recall	26.724 ***	0.120	5.169 ***
	Distortion 1	5.261 *	0.026	−2.294 *
	Delayed Recall	36.699 ***	0.158	6.058 ***
	Yield 1	14.320 ***	0.068	−3.785 ***
	Yield 2	19.472 ***	0.090	−4.413 ***
	Shift	13.784 ***	0.066	−3.713 ***
	Total Suggestibility	23.091 ***	0.105	−4.805 ***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The model showed significant between-subject effects related to age with both immediate and delayed recall and with Yields 1 and 2, shift, and total suggestibility.

IQ showed between-subject effects for immediate recall distortion1 delayed recall yield1 yield2 shift and total suggestibility.

Analyses of variance for repeated measures were performed to test hypothesis 3 and detect the effect of PTSD in reducing recall tasks and increasing distortions and fabrications in delayed recall and in Yield 2. Memory (immediate recall vs. delayed recall), distortion (distortion 1 vs. distortion 2), fabrication (fabrication 1 vs. fabrication 2), and yield (Yield 1 vs. Yield 2) are assumed as measures and age, IQ, and PTSD as covariates. Gender is not assumed because MANOVA analysis does not show a significant effect.

In the first model age showed significant effect on the memory measure (Pillai's value = 0.063, $F = 13.313$, $df (1, 199)$, $p < 0.001$, $\eta^2 = 0.063$, mean difference 4.158, $p < 0.001$) and between-subjects showed effects for age ($F = 32.112$, $p < 0.001$, $\eta^2 = 0.139$) and for IQ ($F = 35.879$, $p < 0.001$, $\eta^2 = 0.153$). PTSD showed no significant effect.

In the second model distortion assumed as measure and only PTSD showed significant effect (Pillai's value = 0.035, $F = 7.168$, $df (1, 199)$, $p < 0.01$, $\eta^2 = 0.035$, between subjects effects: $F = 5.197$, $p < 0.05$, $\eta^2 = 0.026$, estimate parameter for distortion 2: $t 3.240$, $p < 0.001$).

For the fabrication measure within subjects showed effect only for PTSD (Pillai's value = 0.041, $F = 8.417$, $df (1, 199)$, $p < 0.01$, $\eta^2 = 0.041$, mean difference −0.414, $p < 0.001$) and between-subjects showed effects for PTSD ($F = 11.774$, $p < 0.001$, $\eta^2 = 0.056$, estimate parameter for fabrication 2: $t 3.932$, $p < 0.001$) and for IQ ($F = 4.620$, $p < 0.05$, $\eta^2 = 0.023$, estimate parameter for fabrication 2: $t -2.006$, $p < 0.05$).

For the yield measure within subjects showed effect only for PTSD (Pillai's value = 0.059, $F = 13.029$, $df (1, 199)$, $p < 0.001$, $\eta^2 = 0.059$, mean difference −1.552, $p < 0.001$) and between-subjects showed effects for PTSD ($F = 14.851$, $p < 0.001$, $\eta^2 = 0.067$, estimate parameters for Yield 1: $t 2.224$, $p < 0.05$, and for Yield 2: $t 5.009$, $p < 0.001$), age ($F = 37.604$, $p < 0.001$, $\eta^2 = 0.153$, estimate parameters for Yield 1: $t -5.643$, $p < 0.001$, and for Yield 2: $t 5.779$,

$p < 0.001$) and for IQ ($F = 20.889$, $p < 0.001$, $\eta^2 = 0.091$, estimate parameters for Yield 1: $t = -3.864$, $p < 0.001$, and for Yield 2: $t = -4.664$, $p < 0.001$).

5. Discussion

The main objective of this study was to verify the effect of PTSD on memory tasks in relation to the production of two type of confabulation, distortion, and fabrication—especially on the levels of immediate and delayed suggestibility. The participants were children suspected to be victims of sexual abuse involved in psychological evaluations in various Italian courts. As noted by the literature, sexual abuse experienced during childhood can lead to the development of post-traumatic stress symptoms that may affect memory processes and increase suggestibility by altering the child's original memory and reducing his/her ability to testify ([Eisen et al. 2007](#); [Chae et al. 2011](#); [Chae et al. 2014](#); [Gudjonsson et al. 2020](#)).

The preliminary correlational analysis confirmed the assumption of a strong association between suggestibility and PTSD. Furthermore, the presence of PTSD seems to be associated with distortions and fabrications. The fabrications measured in immediate and delayed recall showed significant correlations with PTSD, while they had no associations with the immediate suggestibility scores (with the exception of fabrications 2 with shift and total suggestibility). This implies that the manufactured productions recorded in immediate memory are not associated with the levels of immediate suggestibility, as confirmed by [Smith and Gudjonsson \(1995\)](#). Significant and positive correlations were also found between PTSD and immediate and delayed suggestibility.

The scores related to memory tasks and suggestibility levels were also associated with both intelligence and age, in agreement with several other studies ([Gudjonsson et al. 2016](#); [Gudjonsson 2018](#); [Bruck and Melnyk 2004](#)). According to the literature, memory performance in children increases with age and in relation to the development of intellectual skills. Moreover, the levels of immediate and delayed suggestibility tend to decrease with increasing age and low IQ that are also associated with functional coping strategies ([Maiorano and Vagni 2020](#)). In other words, younger age and low IQ can be considered with respect to the suggestibility of the vulnerability factors, and this is confirmed by the results of this study. Age and IQ are variables that were considered as control factors in all analyses.

The main purpose of the present study was to verify the increase in memory errors and measure the levels of immediate and delayed suggestibility in the presence of PTSD. MANOVA analysis showed the important effect of PTSD both within the subjects and between the subjects. In particular, high PTSD scores seem to affect Yield 1 and Yield 2, as well as delayed suggestibility. Children with PTSD appear to show a greater tendency to make distortions and fabrications in their delayed recall. On the other hand, no effects related to PTSD on immediate recall were recorded, and these results seem to indicate that the processes of immediate recall of new information do not seem to be directly influenced by PTSD ([Chae et al. 2011, 2014](#); [McWilliams et al. 2014](#)). However, the amount of information recalled, and above all, the presence of distortions seemed to depend on age and IQ ([Ridley and Gudjonsson 2013](#); [Gudjonsson 2018](#); [Gudjonsson and Sigurdsson 1995](#)). According to the literature, with increasing age, children seem to be more able to report more information and reduce distortions. Children with intellectual disabilities tend to have more distortions and fabrications. Age, on the other hand, does not seem to have an effect on fabrications, and this seems to suggest that children tend to produce this type of confabulation as an individual characteristic regardless of the age factor. According to several studies, the effect of age is typically found in younger preschool children ([Hritz et al. 2015](#); [Eisen et al. 2019](#)).

As noted by the MANOVA analysis and by the variance for repeated measures, PTSD does not seem to have a direct effect on either immediate or delayed recall tasks, which are affected on the contrary by age and IQ. However, traumatized children show a tendency to provide more delayed recall in terms of the amount of information. It seems possible

to suggest that child victims of traumatic experiences possess adequate skills in the tasks of immediate recall, given that the score of this sample is similar to the standardized one obtained by [Gudjonsson et al. \(2016\)](#). It would seem useful to highlight this finding for the purposes of the child victim's ability to testify. The number of information measured in immediate recall would seem to be linked to age and IQ factors, but not to PTSD. According to [McWilliams et al. \(2014\)](#), children with a traumatized history tend to pay more attention to negative emotional stimuli than positive stimuli, and this may cause them to produce memory errors (distortions and fabrications), which are independent of the correctness of the memory processes.

However, trauma seems to have a significant impact on the levels of suggestibility, leading child victims both to yield to leading questions and to not tolerate the negative feedback provided at the end of the first interview ([Vagni et al. 2018](#); [Chae et al. 2014](#); [Vagni et al. 2021](#); [Gudjonsson et al. 2021](#)). Negative feedback, especially in children with PTSD, appears to increase their sense of uncertainty and fear of disappointing external expectations, leading to an increase in their suggestive vulnerability. The MANOVA results highlight the significant effects of PTSD on Yield 1 and 2 and on delayed suggestibility. The analysis of repeated measures showed that the increase in Yield 2 is due to the effect of PTSD.

In delayed recall, traumatized children, after being exposed to two suggestive interviews and negative feedback, have both a tendency to incorporate misinformation or suggestive information into their original memory, and to distort and invent information. The analysis of repeated measures shows how the presence of PTSD increases the production of distortions and fabrications ([Goodman et al. 2009](#); [Eisen et al. 2019](#)). It is, therefore, likely that the presence of PTSD leading to difficulties in the processes of attention, reorganization of memory material, and source monitoring, in consequence of this, resorting to mechanisms of distortion and fabrication of information.

In fact, other studies have found that PTSD tends to be associated with a tendency to fill memory gaps with invented information ([Gudjonsson 2018](#)).

The MANOVA analysis and the analysis of variance for repeated measures seem to confirm the hypothesis according to which PTSD increases distortions and fabrications and levels of suggestibility. PTSD, as revealed by the analyses carried out in this study, does not appear to have an effect on the initial distortions and fabrications provided in immediate memory. The analysis of repeated measures shows how PTSD leads to an increase in distortions and fabrications in delayed memory. These results seem to indicate how the cognitive processes linked to the production of distorted and fabricated information may refer to mechanisms other than those linked to recall tasks on which PTSD does not seem to have an impact. However, if children are exposed to suggestive information and emotional pressures during their listening, there may be an increase in their memory errors and a delayed memory altered by post-event information. The presence of fabrications in delayed recall appears to be greater in traumatized children with cognitive disabilities.

The present study also highlights how PTSD increases the levels of suggestibility linked more to emotional and relational aspects and less to those more closely related to cognitive aspects. Firstly, as already mentioned, PTSD does not show an impact on immediate recall, and secondly, there is no effect on Yield 1 scores, which is the suggestibility component most closely associated with cognitive factors. In fact, age and IQ have a greater impact on these aspects. PTSD leads to a significant increase in the levels of suggestibility associated with emotional factors measured after negative feedback. Following negative feedback given to the participants at the end of the first suggestive interview, there is an increase in the levels of Yield 2, shift, and total suggestibility—within the subjects there is an effect linked only to PTSD.

The analysis of repeated measures carried out on Yield 1 and 2 showed that PTSD is the only one to have a significant effect on the subjects. The effects among subjects showed that with increasing severity of PTSD and decreasing age and intellectual abilities, greater are levels of Yield 2. These results confirmed hypotheses 3 and 4 of the study,

demonstrating that the presence of PTSD leads to an increase in both confabulation types, in particular fabrications, and in immediate suggestibility scores.

6. Limitations

The present study has several limitations primarily related to the lack of a control group, and this affects the extensibility of the results obtained. The presence of a control group of children with and without post-traumatic disorder would have made it possible to give greater consistency to the results by verifying the association between suggestibility and trauma, even in cases of non-presumed sexual violence.

In other words, the inclusion of a control group as an experimental condition could provide more information in the future about the predictive effect of trauma on the levels of suggestibility or on the impact of a highly stressful context, such as a judicial one.

Moreover, the measure of PTSD is linked to a self-report tool administered to young children, who may not have understood all the items. Instrument response biases may have affected the PTSD scores. The study also lacks a measure of participants' language comprehension and production skills that may have impacted memory tasks. Finally, there is a more complete and general assessment of children's semantic memory skills.

7. Conclusions

The presence of PTSD does not seem to affect the memory recall of witness children at the level of immediate recall tasks. PTSD can be associated in children who are suspected victims of sexual abuse with a greater number of distorted and fabricated information inserted in delayed memory after being exposed to suggestive interview and post-event information. This leads them to incorporate suggestive information or to fill in their memory gaps in an arbitrary way. Distortion errors in both immediate and delayed memory also seem to be more associated with age and the presence of intellectual disabilities, while the presence of trauma tends to increase fabrications, in both immediate and delayed suggestibility. In terms of application in the forensic context, the results of this study seem to indicate how traumatized children may present immediate recall that is adequately accurate and complete in a weighted way for their age and cognitive abilities. However, traumatized children show greater vulnerability to the aspects of leading questions and have a greater tendency to make memory errors in delayed recall after a suggestive interview. After one week and if exposed to leading questions, they may present a recollection with fabrications and post-event information incorporated into the original memory.

When a child presumed to be a victim of sexual abuse is to be heard, it appears important to consider not only the cognitive factors associated with the leading questions, but also the emotional factors that affect the suggestive interview, such as the expectations of success, acquiescence, and compliance. Furthermore, it seems appropriate to listen to them as soon as possible time—avoiding suggestive interviews or exposing them to a sense of inadequacy to do with their story, because this could increase their suggestive vulnerability in relation to greater levels of yielding, but also the risk of alterations in the original memory by producing fabrications.

Judicial hearings represent a situation that is in itself stressful for children. In cases of traumatized children, their vulnerability may increase, and the avoidance of stressors and pressures is essential for their mental wellbeing.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Average scores on age, GSS2, and post-traumatic stress disorder (PTSD) ($n = 221$).

	Mean (SD, Min–Max)
GSS2	
Immediate Recall	12.74 (3.19, 6–17)
Distortion 1	0.56 (0.81, 0–4)
Fabrication 1	0.34 (0.65, 0–3)
Delayed Recall	8.62 (4.10, 1–19)
Distortion 2	0.69 (0.83, 0–4)
Fabrication 2	0.77 (0.91, 0–4)
Yield 1	6.64 (3.85, 0–15)
Yield 2	8.19 (3.94, 0–15)
Shift	5.68 (3.63, 0–18)
Total Suggestibility	12.33 (6.05, 1–30)
Delayed Suggestibility	0.97 (1.06, 0–4)
PTSD	61.70 (12.17, 35–89)
Age	11.94 (3.19, 6–17)
IQ	95.71 (14.03, 60–115)

Table A2. Pearson’s correlations between GSS2 scores ($n = 221$).

	Yield 1	Yield 2	Shift	Total Suggestibility
Immediate Recall	−0.487 ***	−0.434 ***	−0.308 ***	−0.495 ***
Distortion 1	0.021	0.035	0.032	0.033
Fabrication 1	0.075	0.044	0.092	0.103
Delayed Recall	−0.455 ***	−0.408 ***	−0.313 ***	−0.480 ***
Distortion 2	−0.008	0.069	−0.011	−0.011
Fabrication 2	0.075	0.108	0.154 *	0.142 *
Delayed Suggestibility	0.156 *	0.234 **	0.105	0.163 **

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Appendix B

Ethical concerns

The authors have been working in the field of children’s testimony for about 20 years. The awareness that judicial stress can affect children’s wellbeing, especially when they are victims of abuse and/or with a psychological disorder. This work has led the authors over the years to pay special attention to vulnerability factors and they have advised judges what not to do so as to avoid secondary victimization of the children.

The children were met on the orders of a judge before they were heard in court. The children were met in a room, outside the court, set up to accommodate children and adolescents. No judge, lawyer or other judicial figure participated in the meetings, thus avoiding stress factors as much as possible.

At no time were the children asked any questions about their experience of abuse. An interview was conducted with the children on neutral topics and the testing was validated in both clinical and forensic fields. The judicial hearing took place only after the judge’s

evaluation had been made with the help of a psychologist, as required by the Lanzarote protocol. In order to avoid repercussions on the child's wellbeing, when the level of a disorder, psychological distress and PTSD were excessive, a judicial hearing was not recommended in order to avoid further traumatization. But this was not the purpose of the study which is why it was not made explicit. The evaluation of all the children and the collection of the data used in this study was carried out strictly following the specific protocols that in Italy are considered necessary in this context: The Noto IV edition and the SINPIA (Italian Society of Child Neuropsychiatry) protocols. These protocols make it possible to follow non-invasive, correct procedures that guarantee the protection of the minor in judicial situations.

This study aimed to highlight how children with PTSD have a greater vulnerability to suggestive questions, which are more stressful. The results obtained allow us to demonstrate how, especially for traumatized children, suggestive questions and pressure factors during an interrogation are to be avoided because they expose children to stressful situations that risk altering their testimony and the memory of the event. The study did not take into consideration the different forms of sexual abuse and the multiple consequences to which they can lead in social, family, behavioral, etc., terms. In the study, trauma and suggestibility were considered as variables of interest. The application of the results obtained is of a psycho-forensic and non-clinical nature.

The authors believe that showing the association between trauma and suggestibility allows the expert to tell the judge which stress and pressure factors to avoid with children, especially when they are traumatized. The results obtained from the study demonstrate the vulnerability of traumatized children and indicate in judicial situations how to avoid further stress factors in order to avoid secondary or institutional traumatization.

From an ethical point of view, it was guaranteed that, during evaluation, the children were not exposed to any stress factor that could have caused an aggravation of their trauma.

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