Metamemory Beliefs Following Memory Retrieval: Evaluating the Role of Fantasy Proneness

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Abstract

Metamemory beliefs can be defined as assumptions regarding one's own memory (McDonough et al., 2021). Examples include the ideas one has surrounding whether their memories can be subconsciously repressed, or how complete their memory is. Previous research (e.g., Belli et al., 1998) has shown that participants' perceived difficulty of childhood memory recall influences their metamemory beliefs. It has additionally been suggested that fantasy proneness – a trait associated with vivid childhood memories – may moderate the association between the difficulty of recall and memory inaccessibility (Merckelbach et al., 2001a; Wilson & Barber, 1982). To replicate earlier findings regarding metamemory beliefs, and to examine fantasy proneness as a moderating variable of the difficulty-inaccessibility relationship, an online study was conducted. N = 203 first-year psychology students at the University of Groningen were randomly assigned to recall either 4 or 12 childhood memories. After recalling the requested number of memories, participants rated how difficult recall was for them. Participants then evaluated their metamemory beliefs. No statistically significant differences were found in terms of difficulty and metamemory beliefs between conditions. These results indicate that participants attributed the experienced difficulty of recall to the task itself rather than to deficiencies in their memory. Participants' fantasy proneness was assessed using the Creative Experiences Questionnaire (CEQ; Merckelbach et al., 2001b). Results of a hierarchical linear regression showed a moderately strong positive association between difficulty and inaccessibility, to which fantasy proneness minimally contributed.

Keywords: metamemory, childhood memory recall, memory inaccessibility, fantasy proneness

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The False Memory Debate

More than thirty years ago, Shirley Ann Souza visited a therapist to help her analyze and interpret her recurring nightmares, in which she was sexually assaulted by her parents (Loftus & Ketcham, 1994). She did not have any memories of sexual abuse before seeing a therapist. Souza received recovered memory therapy, in which repressed memories of traumatic events are retrieved with the goal of psychological symptom reduction (Lindsay & Read, 1994). This helped her recall memories of sexual abuse at the hands of her parents (Loftus & Ketcham, 1994). Souza concluded that her memories were previously inaccessible as a result of a defense mechanism: "repression, where a traumatic experience is blocked out of consciousness *automatically* and *unconsciously*" (Sauerland & Otgaar, 2021, p. 753). Based solely on recovered memories of childhood sexual abuse, Souza's parents were convicted for sexual assault and battery (Loftus & Ketcham, 1994). It is cases such as these that originally sparked what is known as 'the memory wars' or 'the false memory debate' in psychological literature (Ceci & Loftus, 1994; Ost, 2003; Read & Lindsay, 1994). Some individuals – including laymen (Otgaar et al., 2020), scholars (e.g., Brand et al., 2018; Ross, 2022), and therapists (Houben et al., 2021) – believe that recovered memories are, or can be, authentic. Others are skeptical about the recovery of previously repressed memories. They suggest such memories are likely to be false memories (e.g., Loftus, 1993; Otgaar et al., 2022; Sauerland & Otgaar, 2021). Sauerland and Otgaar (2021) proposed that the former position is problematic, as it invites therapists to use recovered memory therapy on clients. They argued that the consequences of this would be catastrophic, including individuals being falsely accused or imprisoned, and mental health issues, amongst others. Hyman and Billings (1998) noted that

the continued, or even increased, use of recovered memory therapy will lead to the emergence of more false childhood memories.

Previous Research

Metamemory Beliefs

Shirley Ann Souza's belief in the existence of repressed memories is what is known as a metamemory belief: an assumption about how one's own memory functions (McDonough et al., 2021). Multiple studies have been conducted to determine what influences metamemory beliefs. In such studies, participants were typically randomly assigned to one of two conditions: recalling either several (usually 4) or a lot (usually 12) of childhood memories (Belli et al., 1998; Merckelbach et al., 2001a; Winkielman et al., 1998; Winkielman & Schwarz, 2001). Afterward, participants were asked to rate the difficulty of the recall task. As expected, participants instructed to recall many memories found the retrieval task significantly more difficult than those who were asked to recall several memories. Belli and colleagues (1998) and Winkielman and others (1998) additionally assessed participants' childhood memory completeness following recall, and found that those who recalled many memories reported lower completeness compared to participants who retrieved a few memories. Belli and colleagues (1998) posited that participants evaluated the completeness of their memory based on the difficulty that they experienced recalling the requested number of memories rather than on the number of memories they retrieved. In other words, participants employed the availability heuristic: "[A] person could estimate the numerosity of a class, the likelihood of an event, or the frequency of co-occurrences by assessing the ease with which the relevant mental operation of retrieval, construction, or association can be carried out" (Tversky & Kahneman, 1973, p. 208). Winkielman and Schwarz (2001) assessed how the difficulty of recall relates to ratings of childhood pleasantness, and observed that participants who both (a) held the metamemory belief that negative childhood events are difficult to

remember, and (b) were asked to recall a lot of childhood memories, may erroneously judge their childhood as unpleasant retrospectively. Merckelbach and colleagues (2001a) instructed participants to rate their agreement with statements regarding the inaccessibility and repression of childhood memories following memory retrieval. Results showed that participants who retrieved a lot of childhood memories reported lower memory accessibility, and less agreement with the assertion that many of their childhood memories are repressed compared to those participants who recalled only several memories.

Wessel and others (2020) collected the metamemory questionnaires described above, and asked participants to complete all of them consecutively to examine the influence of perceived difficulty on metamemory beliefs. They also included a specified repression measure (adapted from Houben et al., 2021). The unspecified repression statement (Merckelbach et al., 2001a) contains the term 'repression' without any further explanation of what this label entails, whereas specified repression statements (Houben et al., 2021) do not include the word 'repression,' and instead contain specific assumptions associated with repression. They found no statistically significant differences between participants who recalled several and those who recalled many childhood memories on the metamemory questionnaires.

Fantasy Proneness

Wilson and Barber (1982) described a personality trait known as fantasy proneness. Individuals high in fantasy proneness frequently engage in fantasy and typically have vivid childhood memories (Merckelbach, 2004; Wilson & Barber, 1982). Additionally, they seem to have the ability to relive memories as if they were happening presently rather than in the past (Wilson & Barber, 1982).

Merckelbach and colleagues (2001a) examined if fantasy proneness correlates with childhood memory inaccessibility. The Creative Experiences Questionnaire (CEQ; Merckelbach et al., 2001b) was used as a measure of fantasy proneness. Results showed a

statistically significant, moderately strong negative correlation between fantasy proneness and childhood memory inaccessibility (Merckelbach et al., 2001a). In other words, the higher participants' ratings of fantasy proneness, the less they agreed with the statement that their memories from childhood are difficult to access. Using a design in which participants were asked to recall negative childhood memories specifically, Wessel et al. (2021) were unable to replicate this finding. The negative correlation between fantasy proneness and memory inaccessibility in their sample was negligible and statistically non-significant. Based on the negative correlation between fantasy proneness and memory inaccessibility found in their sample, Merckelbach and others (2001a) proposed that fantasy proneness may moderate the relationship between recall difficulty and metamemory beliefs, such as memory inaccessibility. Participants high in fantasy proneness may attribute the experienced difficulty of memory retrieval to the task itself, whereas participants low in fantasy proneness may incorrectly ascribe this difficulty to the inaccessibility of their childhood memories.

The Present Study

Previous research has focused on the influence of recalling childhood memories and the perceived difficulty associated with that task on metamemory beliefs. The goal of the current study – which was a conceptual replication of Wessel and colleagues (2020) – was to assess the influence of retrieving 12 compared to 4 childhood memories on metamemory beliefs. The present study additionally explored fantasy proneness as a moderator of the association between the perceived difficulty of memory recall and memory inaccessibility, as proposed by Merckelbach and others (2001a).

The current study utilized the typical design outlined above, with a couple of deviations. Participants were instructed to recall memories from before the age of 12, instead of memories from ages 5 – 8 and 8 – 10, specifically. Additionally, participants were asked to rate the extent to which each of their recalled memories was positive or negative. This

allowed my fellow researcher to examine emotional valence as a moderator of the relationship between the perceived difficulty of recall and memory completeness. Finally, Visual Analogue Scales (VAS) were used as less restrictive response fields compared to the Likert scales used in previous studies.

Hypotheses

Participants instructed to recall a lot (12) of childhood memories were compared to those who were asked to recall several (4) memories. We expected that participants in the 12-memory condition would:

(a) Judge the memory recall task as more difficult;

(b) Judge their childhood memories as less accessible and less complete;

(c) Agree more with statements implying that their childhood memories are repressed;

(d) Judge their childhood as less pleasant.

We additionally hypothesized that fantasy proneness would moderate the relationship between the perceived difficulty of recall and memory inaccessibility.

Method

Statement of Transparency

The present study was pre-registered on the Open Science Framework application (https://osf.io/9w5bx). The materials and anonymized data will be made publicly available there once the current project is completed.

Participants

N = 203 first-year psychology students (age: M = 20.20, SD = 2.21, range = 18 – 33) at the University of Groningen participated in this study (Table 1). Recruitment occurred exclusively via the SONA pools of Dutch and international first-year psychology students at the University of Groningen. Participants received course credits for participating in the study.

The Ethics Committee of the Faculty of Behavioral and Social Sciences (EC-BSS) at the University of Groningen granted ethics approval for this study (PSY-2223-S-0244).

Table 1

Characteristics of Participants

Characteristic	4-Memory Condition		12-Memory Condition		Full Sample	
	n	%	*n*	%	*n*	%
Gender						
Male	28	27.5	24	23.8	52	25.6
Female	72	70.6	73	72.3	145	71.4
Non-binary	2	1.9	4	3.9	6	3.0
Prefer not to say	-	-	-	-	-	-
Native language						
Dutch	57	55.9	63	62.4	120	59.1
German	21	20.6	20	19.8	41	20.2
Other	24	23.5	18	17.8	42	20.7

Power Analysis

G*Power (Faul et al., 2009) was used to conduct an a priori power analysis, which revealed a desired sample size of $N = 172$ participants, based on the following parameters: (a) the standard significance level $\alpha = .05$, divided by the total number of statistical tests conducted for the main analyses (6) as a means of family-wise error rate adjustment, so $\alpha = .05/6 = .008$; (b) a medium effect size of Cohen's $d = 0.50$ (Cohen, 1988); and (c) a power of .80.

An a posteriori sensitivity analysis was performed using G*Power (Faul et al., 2009). The conducted independent samples *t*-tests were sensitive to effects of Cohen's $d = 0.46$, given $N = 203$, $\alpha = .008$ and a power of .80. Effects smaller than Cohen's $d = 0.46$ could therefore not be reliably identified (Bartlett, 2022).

Design

The present study used a between-subjects design with two conditions: recalling 4, or 12 childhood memories. A within-subject model was used to examine fantasy proneness as a moderator of the association between memory task difficulty and memory inaccessibility.

Materials

Qualtrics

Participants completed the questionnaire digitally in the Qualtrics environment (https://www.qualtrics.com).

Memory Task

Participants received the following instructions: "In the space below please write down one childhood memory from before the age of 12. Please specify the place (e.g., 'at school,' or 'at home'), the content and the actors (by noting their initials or relationship status) in the memory" (adapted from Winkielman et al., 1998; Merckelbach et al., 2001a). Participants were also instructed: "Please indicate how negative or positive this memory is to you now," using a Visual Analogue Scale (VAS) (0 = extremely negative, 100 = extremely positive). Participants were asked to estimate their age for each recalled memory using a drop-down menu with choices ranging from 0 – 12.

Difficulty

The difficulty of memory recall was assessed using the following item: "You have just been asked to write down several different childhood events. How difficult was the task for you?" on a VAS (0 = extremely easy, 100 = extremely difficult) (Winkielman et al., 1998). This item functioned as the manipulation check for the number of childhood memories that participants recalled.

Metamemory Beliefs

Inaccessibility. Participants' memory inaccessibility was assessed using a Visual Analogue Scale (VAS; 0 = strongly disagree, 100 = strongly agree) for the item "[m]any of my childhood memories are difficult to access" (Merckelbach et al., 2001a).

Completeness. Completeness was evaluated based on agreement with the following statement: "Regarding my childhood memory, there are large parts of my childhood after the

age of 5 that I can't remember" (VAS: 0 = strongly disagree, 100 = strongly agree) (Winkielman et al., 1998).

Unspecified Repression. Unspecified repression beliefs were rated using the following item: "I have repressed many of my childhood memories" (VAS: 0 = strongly disagree, 100 = strongly agree) (Merckelbach et al., 2001a).

Specified Repression. Specified repression beliefs were examined using scores on VAS (0 = strongly disagree, 100 = strongly agree) for three statements ("It is quite possible that certain childhood memories are blocked. That means that they are stored somewhere in my unconscious mind, but I cannot access them, even if I try"; "It is quite possible that certain memories in my unconscious mind cause symptoms"; "It is quite possible that becoming aware (i.e., remembering) of my unconscious memories will lead to a relief from symptoms") (Wessel et al., 2020). These items were found to have an acceptable level of internal consistency (Cronbach's $\alpha = .770$).

Childhood Pleasantness. Childhood pleasantness was based on agreement with five questions (e.g., "How pleasant was your childhood?") using VAS (e.g., 0 = not at all pleasant, 100 = extremely pleasant) (Winkielman & Schwarz, 2001). The five childhood pleasantness items (with two reverse-coded items) were found to have a high internal consistency (Cronbach's $\alpha = .879$).

Attention Check

An attention check was used to identify inattentive responders: "Please select the end (at the right) of the scale" (VAS 0 – 100).

Alternative Difficulty

For exploratory purposes, we created two alternatively phrased difficulty items: "How difficult was it for you to come up with the requested number of unique memories?" (VAS: 0

= extremely easy, 100 = extremely difficult) and "How much effort did it take you to come up with the requested number of unique memories?" (VAS: 0 = not at all, 100 = extremely).

Fantasy Proneness

The Creative Experiences Questionnaire (CEQ; Merckelbach et al., 2001a) was used to assess participants' fantasy proneness. It consists of items such as "I often confuse fantasies with real memories." Participants responded either with "yes" (scored as 1) or "no" (scored as 0) to each of the 25 items. A higher sum score on the CEQ corresponds to higher fantasy proneness. The CEQ showed an acceptable level of internal consistency (Cronbach's α = .748).

Demographics

Participants were instructed to report their age using an open-ended question, their gender using a multiple-choice question ("male," "female," "non-binary," "prefer not to say"), and their native language using an open-ended question.

Method Checks

Participants were presented with the following text: "We now want to ask you some questions about the circumstances under which you completed this questionnaire. Your answers will not have any consequences for the SONA credits you receive. Your honesty is appreciated." They were then asked: "Were you alone whilst completing this questionnaire?" Response options were "yes" and "no." Only participants that answered "no" were presented with the following closed question ("yes" or "no"): "Were you with someone who helped you retrieve any of the childhood memories that you were asked to list previously?" All participants were asked "[o]n what device did you complete this questionnaire?" This multiple choice question had "computer," "smartphone," "tablet," and "other, ___" as response options. Participants were also asked an open-ended question: "Where did you complete this questionnaire? (e.g., at home, university library, café)." Participants additionally responded to

the following item: "Please indicate to what extent you were distracted during completing the questionnaire" using a VAS (0 = not at all distracted, 100 = extremely distracted).

Evaluation

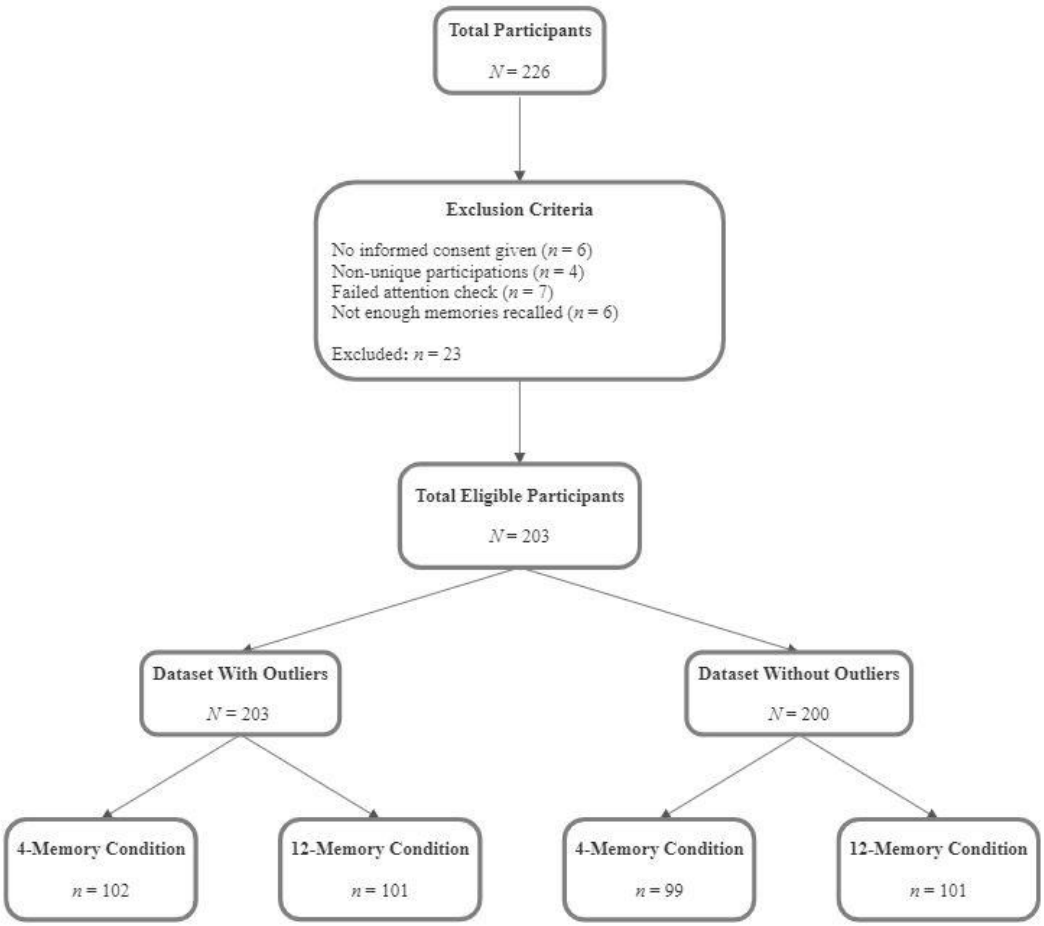
Two open-ended evaluation questions were included so that participants could leave their feedback about the methodology of the study: "What aspects of this study did you appreciate?" and "What aspects of this study do you think could be improved?" Additionally, participants responded to the following item: "What do you think the purpose of this study is?"

Procedure

Participants accessed the online questionnaire via Qualtrics. They were asked to complete the study in a quiet environment. This was reiterated in the research information, which participants read and downloaded. Afterward, they downloaded the informed consent form, and consented to participation in the research. Participants were randomly assigned to one of two conditions (recalling either 4 or 12 childhood memories) using the Qualtrics Randomizer. They then completed the memory retrieval task. Participants then completed the manipulation check in the form of the difficulty item. Afterward, they responded to the inaccessibility, completeness, unspecified repression, and specified repression items. Participants responded to an attention check, which was followed by childhood pleasantness statements. Participants were then asked to rate their agreement with the alternatively formulated difficulty items. Participants in the 4-memory condition were asked to retrieve an additional 8 memories to ensure that all participants were able to retrieve 12 memories. Participants in both conditions then completed the CEQ. Following this, participants were asked to answer demographic questions, before responding to method check items. Participants were asked to evaluate the study and to guess its purpose. Finally, they were presented with a debriefing form, which described the purpose and hypotheses of the study.

Figure 1

Flow Diagram of Participants



Statistical Analyses

Exclusion Criteria

The exclusion criteria listed below are in accordance with the pre-registration, and are visualized in Figure 1.

Participants who did not consent to (a) participating in the research, and/or (b) their responses being analyzed, were removed from the dataset before data analysis began.

Participants with insufficient scores on the attention check were excluded from data analysis as they may have been responding in a careless manner.

Participants who did not recall at least 3 (4-memory condition) or 9 (12-memory condition) unique memories were discarded. Participants in the 4-memory condition who

failed to report 5 additional unique memories after finishing the metamemory belief questions were also excluded from the dataset.

Two datasets were created for data analysis. Outliers were included in the first data file, and excluded in the second. Outliers were defined as observations more than 1.5 outside of the IQR. $n = 2$ outliers were detected on the CEQ, and $n = 1$ outlier was identified on the childhood pleasantness items (Appendix A).

Assumptions

Assumptions of the performed statistical analyses were tested using IBM SPSS Statistics 28. Despite violations of the normality assumption, independent samples *t*-tests were conducted, as the central limit theorem applies given the large sample size of this study (Appendices A, B; Tabachnick & Fidell, 2014).

Metamemory Beliefs

Independent samples *t*-tests were conducted for each of participants' difficulty, inaccessibility, completeness, unspecified repression, specified repression, and childhood pleasantness scores to test whether they differed per condition.

Fantasy Proneness

CEQ sum scores were used as a measure of participants' fantasy proneness. Participants' CEQ sum scores and perceived difficulty of memory recall scores were centered. The interaction between the centered variables was computed by multiplying them. The interaction was regressed on participants' inaccessibility scores using hierarchical linear regression. In the first step of the model, the centered difficulty scores and centered CEQ scores were added. In the second step of the model, the interaction term was included. Correlations of the main effects were additionally collected. R-squared change was obtained to identify the unique contribution of fantasy proneness to the difficulty-inaccessibility

relationship. This was done to test the hypothesis that the association between difficulty and inaccessibility is moderated by fantasy proneness.

Results

Datafiles

The analyses were conducted using (a) the complete dataset (N = 203), and (b) a dataset that excludes outliers (N = 200) as per the pre-registration (https://osf.io/9w5bx).

Main Analyses

Manipulation Check: Difficulty

We hypothesized that participants tasked with recalling 12 memories would score higher on the difficulty item than participants who were asked to recall 4 memories. No statistically significant difference between the two conditions was found (Tables 2, 3).

Inaccessibility and Completeness

Our second hypothesis was that participants in the 12-memory condition would assess their childhood memories to be both less accessible and less complete compared to participants in the 4-memory condition. No statistically significant differences were found between the conditions (Tables 2, 3).

Table 2

Results of Independent Samples t-Tests Comparing Metamemory Belief Mean Scores per Condition (Outliers Included)

Variable	4-Memory Condition n = 102		12-Memory Condition n = 101		$t(201)$	p	Cohen's d
	M	*SD*	*M*	*SD*			
Difficulty	41.49	26.24	47.49	25.86	-1.64	.051	-0.23
Inaccessibility	46.55	27.11	54.58	26.88	-2.12	.018	-0.30
Completeness	54.09	28.35	51.82	29.53	0.56	.289	0.08
Repression							
Unspecified	38.12	29.13	32.90	27.20	0.12	.094	0.19
Specified	48.32	23.18	50.15	23.01	-0.57	.286	-0.08
Pleasantness	65.80	20.56	66.89	17.36	-0.41	.343	-0.06

* p < .008.

Table 3

Results of Independent Samples t-Tests Comparing Metamemory Belief Mean Scores per Condition (Outliers Excluded)

Variable	4-Memory Condition n = 99		12-Memory Condition n = 101		t(198)	p	Cohen's d
	M	*SD*	*M*	*SD*			
Difficulty	42.30	26.20	47.49	25.86	-1.41	.080	-0.20
Inaccessibility	47.31	27.02	54.58	26.88	-1.91	.029	-0.27
Completeness	53.31	28.31	51.82	29.53	0.36	.358	0.05
Repression							
Unspecified	36.69	28.31	32.90	27.20	0.97	.168	0.14
Specified	47.43	22.85	50.15	23.01	-0.84	.201	-0.12
Pleasantness	67.04	19.46	66.89	17.36	0.06	.475	0.01

* p < .008.

Repression

We predicted that, compared to participants in the 4-memory condition, participants in the 12-memory condition would agree more with statements implying that their childhood memories are repressed. No statistically significant differences in means between conditions were found on either the unspecified or specified repression items (Tables 2, 3).

Childhood Pleasantness

We hypothesized that participants in the 12-memory condition would report a less pleasant childhood than those in the 4-memory condition. No statistically significant differences in means between conditions was observed, however (Tables 2, 3).

Fantasy Proneness

We hypothesized that fantasy proneness would moderate the association between the difficulty of recall and inaccessibility. In both datasets, a moderate positive correlation between difficulty and inaccessibility was found (Figures 2, 4, Tables 4, 5). Fantasy proneness negligibly correlates with metamemory beliefs, including accessibility (Figures 3, 4, Tables 4, 5).

Figure 2

Scatterplot of the Correlation Between Inaccessibility and Difficulty

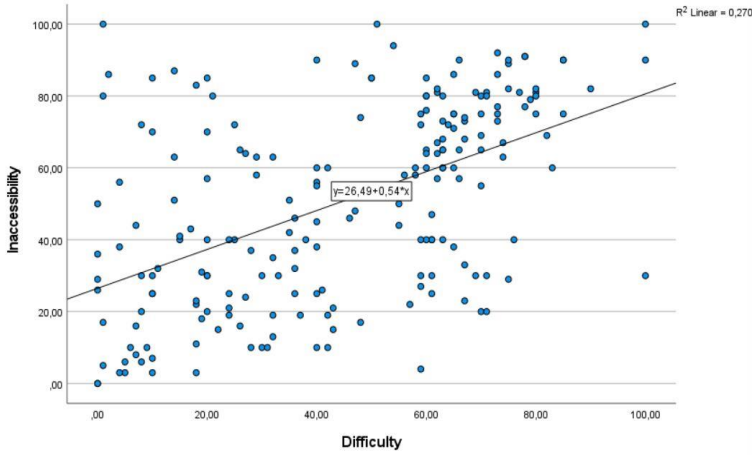


Figure 3

Scatterplot of the Correlation Between Inaccessibility and Fantasy Proneness

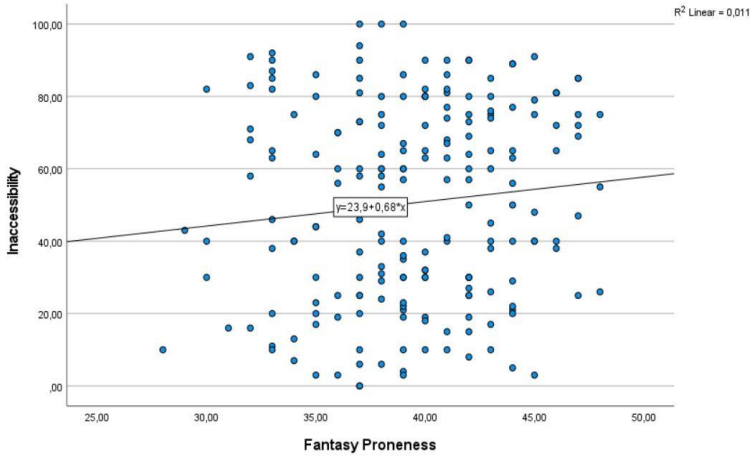
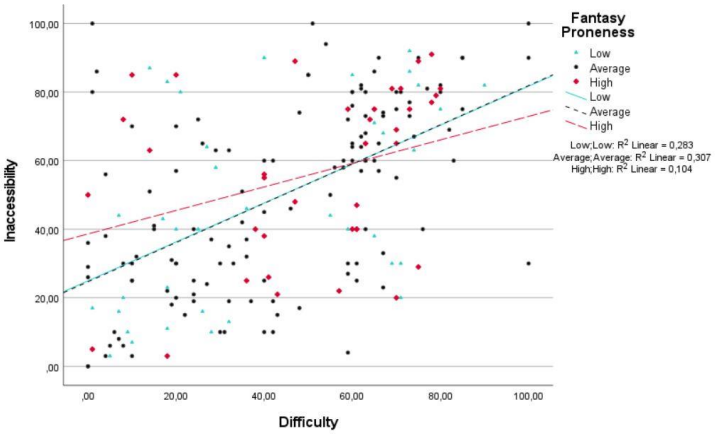


Figure 4

Scatterplot of the Correlations Between Inaccessibility, Difficulty, and Fantasy Proneness



Note. For the purpose of this scatterplot, low fantasy proneness was defined as 1 *SD* below the mean; average fantasy proneness as within 1 *SD* of the mean, and; high fantasy proneness as 1 *SD* above the mean.

Table 4

Correlations Between Metamemory Beliefs and Fantasy Proneness (Outliers Included)

Variable	1	2	3	4	5	6	7
1. Difficulty	-						
2. Inaccessibility	.52**	-					
3. Completeness	.28**	.62**	-				
Repression							
4. Unspecified	.18*	.42**	.37**	-			
5. Specified	.12	.29**	.33**	.52**	-		
6. Pleasantness	-.12	-.29**	-.22**	-.58**	-.37**	-	
7. Fantasy	.13	.11	.06	-.20**	-.16*	.27**	-
Proneness							

Note. N = 203.

*p < .05. **p < .01.

Table 5

Correlations Between Metamemory Beliefs and Fantasy Proneness (Outliers Excluded)

Variable	1	2	3	4	5	6	7
1. Difficulty	-						
2. Inaccessibility	.51**	-					
3. Completeness	.30**	.65**	-				
Repression							
4. Unspecified	.21**	.46**	.36**	-			
5. Specified	.15*	.33**	.32**	.50**	-		
6. Pleasantness	-.17*	-.34**	-.20**	-.55**	-.35**	-	
7. Fantasy	.10	.08	.09	-.15*	-.12	.22**	-
Proneness							

Note. N = 200.

*p < .05. **p < .01.

Results of the hierarchical linear regression based on the complete dataset (β = -0.43, $t(200) = -1.02$, $p = .307$, $\Delta R^2 = .004$) as well as on the dataset with no outliers present (β = -0.35, $t(197) = -0.78$, $p = .437$, $\Delta R^2 = .002$) showed that fantasy proneness' contribution to the relationship between the difficulty of retrieval and inaccessibility is limited.

Exploratory Analyses

Alternative Difficulty Items

Table 6

Results of Independent Samples t-Tests Comparing Alternative Difficulty Mean Scores per Condition (Outliers Included)

Variable	4-Memory Condition n = 102		12-Memory Condition n = 101		$t(201)$	p	Cohen's d
	M	*SD*	*M*	*SD*			
Alt. Difficulty	43.44	28.36	50.90	27.49	-1.90	.029*	-0.27
Effort	44.34	27.18	54.93	23.53	-2.97	.002*	-0.42

Note. Alt. Difficulty = "How difficult was it for you to come up with the requested number of unique memories?"; Effort = "How much effort did it take you to come up with the requested number of *unique* memories?"

* p < .05.

Table 7

Results of Independent Samples t-Tests Comparing Alternative Difficulty Mean Scores per Condition (Outliers Excluded)

Variable	4-Memory Condition n = 99		12-Memory Condition n = 101		$t(198)$	p	Cohen's d
	M	*SD*	*M*	*SD*			
Alt. Difficulty	44.36	28.25	50.90	27.49	-1.66	.049*	-0.24
Effort	45.30	26.98	54.93	23.53	-2.69	.004*	-0.38

Note. Alt. Difficulty = "How difficult was it for you to come up with the requested number of unique memories?"; Effort = "How much effort did it take you to come up with the requested number of *unique* memories?"

* p < .05.

Participants in the 12-memory condition reported both statistically significantly more difficulty and effort with regard to recalling the requested number of unique childhood memories compared to participants in the 4-memory condition (Tables 6, 7). Corresponding effect sizes were small (Cohen, 1988).

Method Checks

Twenty-six (12.8%) of N = 203 participants reported that they were not alone during their completion of the study. Two (8%) of these participants additionally declared that they received help recalling childhood memories. Overall, participants reported low levels of distraction during the questionnaire (M = 17.22, SD = 19.29).

Discussion

This study aimed to assess the influence of retrieving 12 compared to 4 childhood memories on metamemory beliefs, in an attempt to replicate earlier findings (e.g., Belli et al., 1998). Additionally, this study aimed to explore fantasy proneness as a moderating variable of the relationship between the perceived difficulty of recall and memory inaccessibility.

Summary of Results

Participants instructed to recall 12 childhood memories were compared to those who were asked to recall 4 memories. Results showed no statistically significant differences between conditions in terms of the perceived difficulty of retrieval. The effect size of this manipulation check was small (Cohen, 1988). Participants did not differ with regard to metamemory beliefs per condition: statistically non-significant results were found on the completeness, inaccessibility, unspecified repression, specified repression, and childhood pleasantness items. The effect size of the inaccessibility item was small (Cohen, 1988). Negligible effect sizes were observed for the other metamemory beliefs.

Fantasy proneness was examined as a potential moderator of the relationship between the perceived difficulty of memory retrieval and inaccessibility, as proposed by Merckelbach and others (2001a). Results showed that the contribution of fantasy proneness to the association between difficulty and inaccessibility was minimal.

Implications

The current study as well as Wessel and others (2020) and Wessel and colleagues (2021) were unable to replicate the findings of earlier studies on the influence of memory recall on metamemory judgments. Belli and colleagues (1998), Winkielman and others (1998), and Merckelbach and colleagues (2001a) proposed that – consistent with the availability heuristic – participants may evaluate their memory completeness using the experienced difficulty of memory retrieval. Whereas participants who recalled a lot of

memories in those studies scored statistically significantly higher compared to participants who recalled several memories only. The non-replication of this finding in both the present study and in earlier replication studies (Wessel et al., 2020, 2021) suggests that participants may not have incorrectly attributed the difficulty of memory recall to the incompleteness of their memory (Belli et al., 1998; Winkielman et al., 1998). Instead, they may have realized that recalling a lot of memories is difficult and mainly ascribed the experienced difficulty of recall to the task itself. Additionally, when individuals complete a memory task that is relevant to them on a personal level, they tend to focus on the content they retrieved (Schwarz, 1998). Participants may have considered childhood memory recall as relevant to them, and consequently based their rating of memory completeness on the fact that they were able to retrieve the requested number of memories.

Regarding the hypothesis that participants instructed to recall a lot of childhood memories would rate their childhood as less pleasant compared to those directed to recall a few childhood memories, non-statistically significant differences between conditions with a minimal effect size were found. This entails a non-replication of previous research by Winkielman and Schwarz (2001). Perhaps a key difference in methodology between the original and the present study (as well as Wessel et al., 2020, 2021) is that the initial research included a manipulation of memory recall. Before rating their childhood pleasantness, they were presented with a short text in which it was explicitly mentioned that either pleasant or unpleasant childhoods are difficult to remember (Winkielman & Schwarz, 2001). Such priming has not been implemented in replication studies. This may explain why participants instructed to recall many memories did not evaluate their childhood as less pleasant compared to those directed to recall a few childhood memories.

The present study explored fantasy proneness as a moderator of the association between difficulty and inaccessibility. Results showed a moderately strong positive

correlation between difficulty and inaccessibility. Fantasy proneness' unique contribution to this association was, however, negligible. Fantasy proneness showed no notable correlation with difficulty or inaccessibility, nor with the remaining metamemory beliefs. This is a non-replication of Merckelbach and colleagues (2001a), who found a moderately strong negative association between fantasy proneness and memory inaccessibility. Wessel and others (2021) were also unable to replicate this negative correlation. It may be the case that the extreme vividness of childhood memories, a feature of fantasy proneness, refers to the level of detail of childhood memories that can be recalled rather than the ease with which childhood memories can be accessed.

Methodological Considerations

One methodological limitation of the present study is that the sample consists only of first-year psychology students. As such, the generalizability of the presented findings may be poor.

A second limitation is that the manipulation of difficulty appeared to be unsuccessful, as evidenced by the statistically non-significant difference between conditions. The conducted statistical analyses concerning metamemory beliefs were thus less informative than anticipated. When compared with participants who recalled a few memories, participants who recalled many memories showed statistically significantly higher scores with small effect sizes on the alternatively formulated difficulty items. The manipulation check was intended as a means to assess participants' difficulty with recalling the number of requested memories only. Instead, participants may have based their agreement with the manipulation check on how difficult it was for them to recall the requested number of memories, to evaluate the emotional valence of each memory, and to estimate their age per memory. Therefore it seems beneficial to replace the current manipulation check with one of the alternative difficulty items. "How difficult was it for you to come up with the requested number of unique

memories?" seems to overlap more with the definition of the availability heuristic than does "[h]ow much effort did it take you to come up with the requested number of unique memories?" (Tversky & Kahneman, 1973). The latter item may, however, be less ambiguous and showed a slightly larger effect size. A fellow researcher involved in this study is developing a lab pilot study that aims to examine how participants interpret the current (metamemory) items, to identify which items need to be revised for the sake of clarity as well as validity. Perhaps this issue could receive attention in this pilot study.

A third limitation of this study is that it was conducted in an online environment. Wessel and colleagues (2021) identified that asking participants to recall childhood memories online may be problematic for a couple of reasons. First of all, participants are likely to be more distracted when completing the questionnaire online than in the laboratory. We explicitly asked participants to be in a distraction-free environment, yet participants reported being at least somewhat distracted during the study, with some participants even responding that they were completely distracted. Additionally, when participants complete the survey online, they may receive help from others, such as their friends or relatives, which would defeat the purpose of the manipulation of difficulty. Therefore, we asked respondents to honestly indicate whether or not they received outside help during the memory recall task. We provided a disclaimer that this would not affect the compensation they would receive for participating in this study. Two participants self-reported receiving help from others during memory retrieval. Given the reported data on distraction levels and assistance received, we strongly recommend that future research on the topic of metamemory judgment formation is conducted in a laboratory setting. This would likely result in a less distracting environment, and would prevent participants from receiving help in retrieving childhood memories.

Conclusion

The goal of the present study was to assess the influence of retrieving many (12) compared to a few (4) childhood memories on metamemory beliefs. The manipulation of difficulty was unsuccessful, and metamemory beliefs did not differ statistically significantly differ per condition. The current study additionally explored fantasy proneness as a moderator of the association between the difficulty of childhood memory recall and inaccessibility, as suggested by Merckelbach and others (2001a). While a moderately strong positive correlation between difficulty and inaccessibility was observed in the sample, fantasy proneness hardly contributed to this association.

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Appendix A

The boxplots below display the distribution and outliers for the metamemory beliefs and CEQ questionnaires per condition.

Figure 5

Boxplot of Difficulty

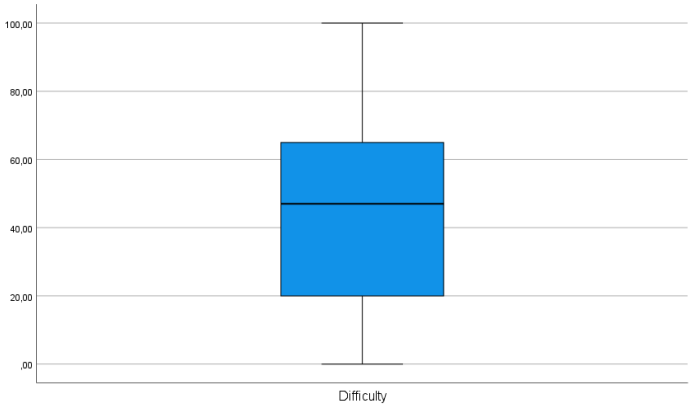


Figure 6

Boxplot of Inaccessibility

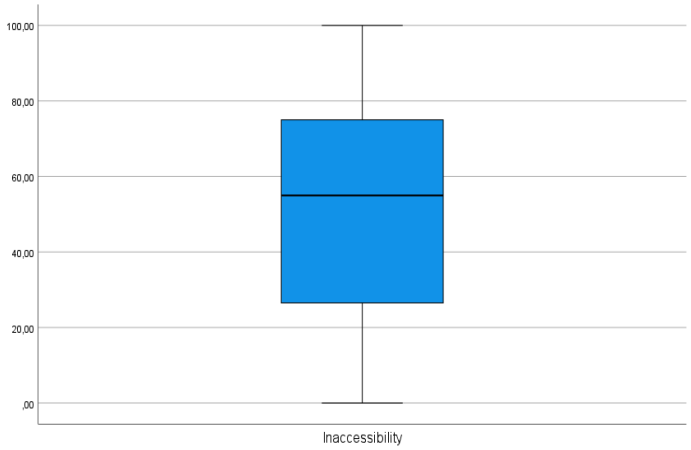


Figure 7

Boxplot of Completeness

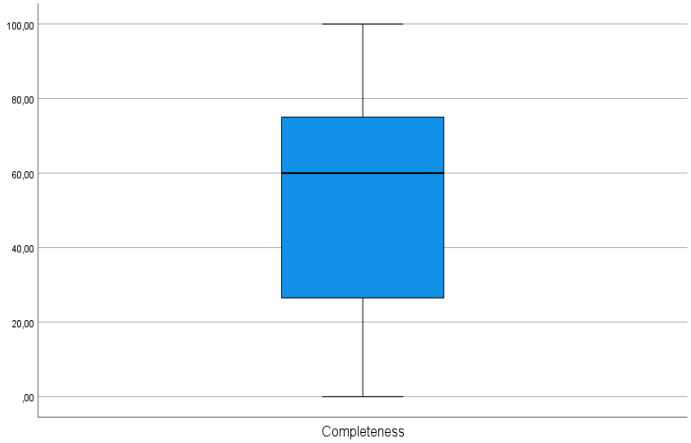


Figure 8

Boxplot of Unspecified Repression

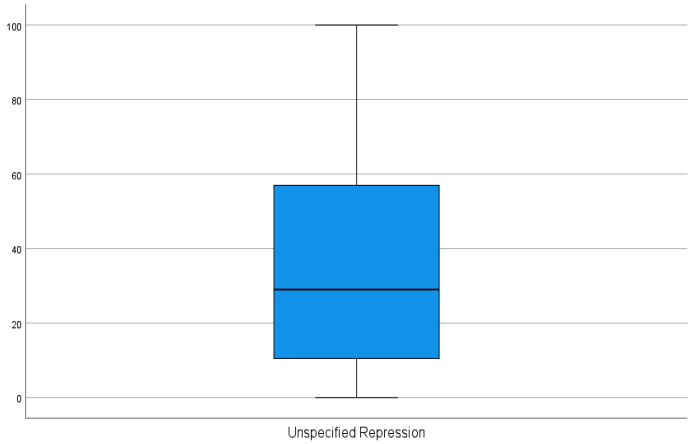


Figure 9

Boxplot of Specified Repression

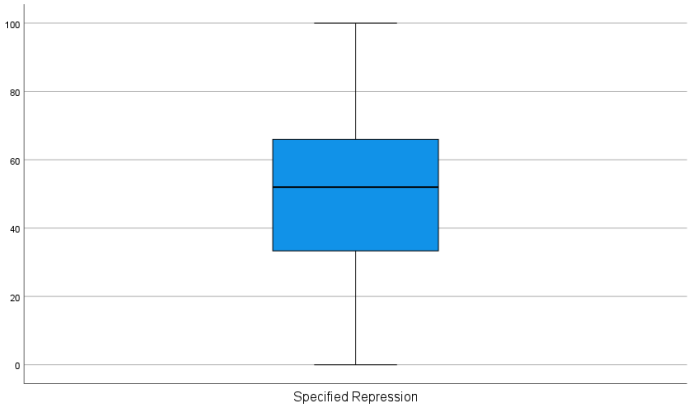


Figure 10

Boxplot of Childhood Pleasantness

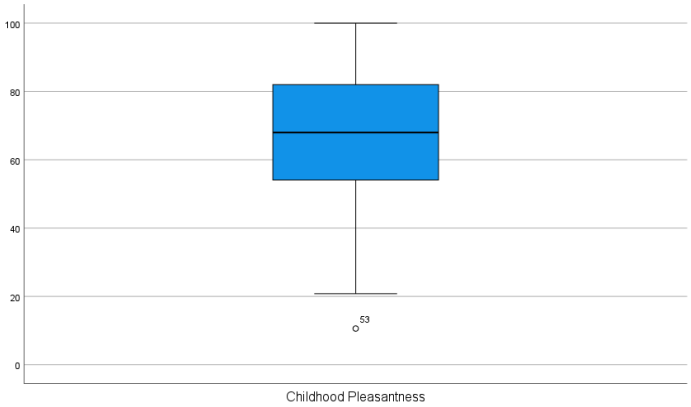
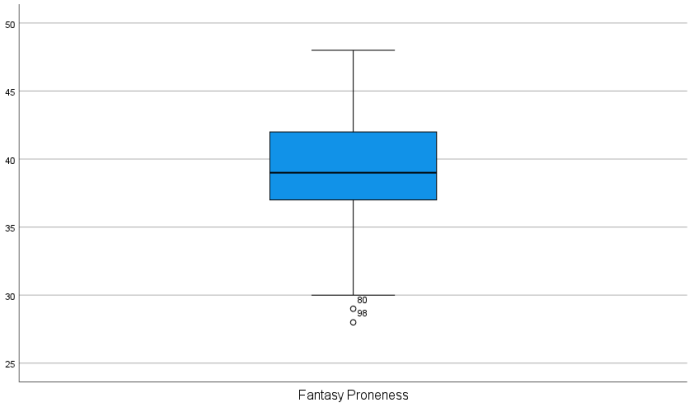


Figure 11

Boxplot of Fantasy Proneness (CEQ)



Appendix B

Histograms showing the distribution of the metamemory questionnaires and CEQ are displayed in the figures below.

Figure 12

Histogram of Difficulty per Condition

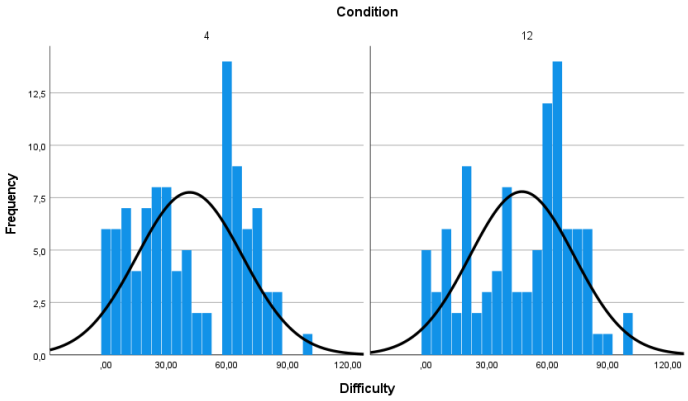


Figure 13

Histogram of Inaccessibility per Condition

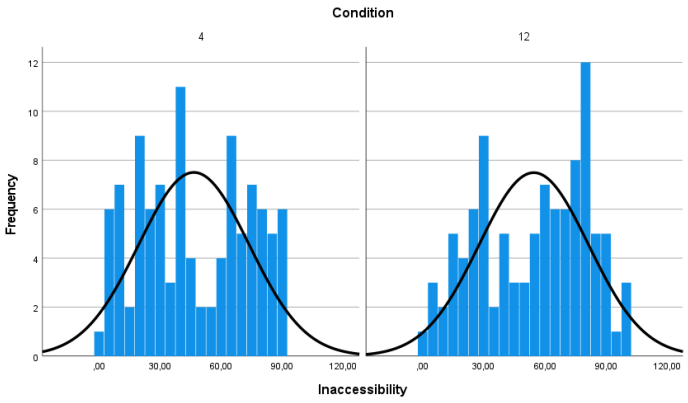


Figure 14

Histogram of Completeness per Condition

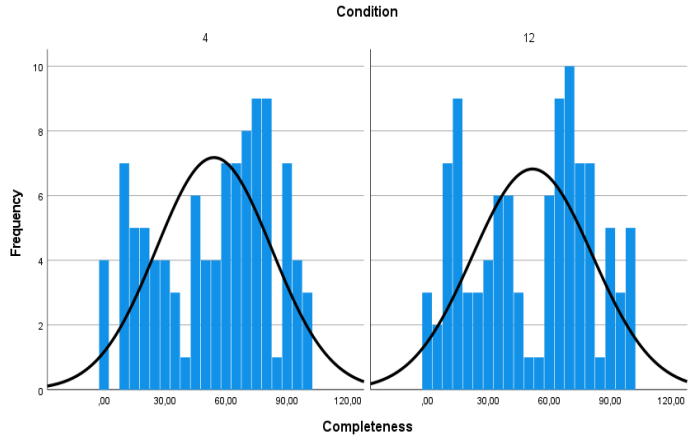


Figure 15

Histogram of Unspecified Repression per Condition

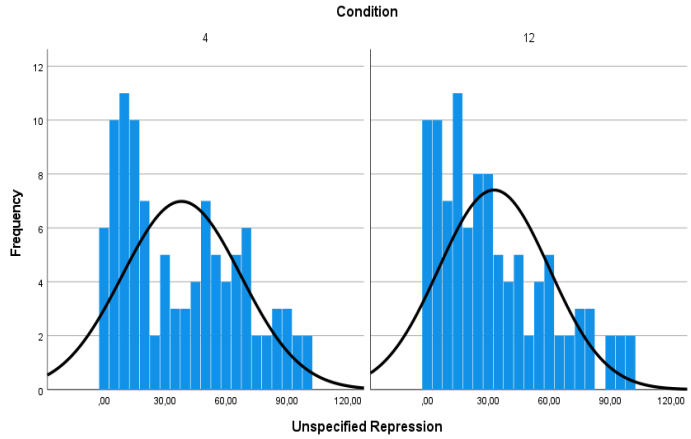


Figure 16

Histogram of Specified Repression per Condition

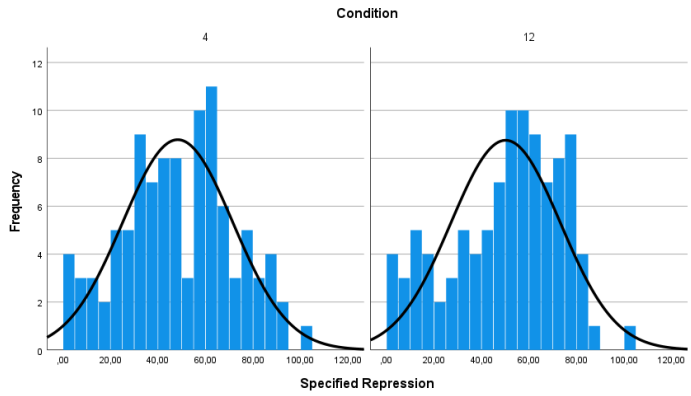


Figure 17

Histogram of Childhood Pleasantness per Condition

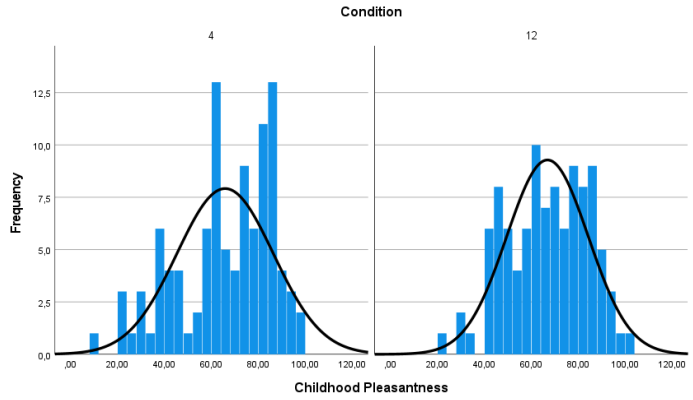


Figure 18

Histogram of Fantasy Proneness (CEQ) per Condition