

**What is the effect of recalling 12 compared to 4 negative childhood memories on
metamemory beliefs?**

Charlotte Melanie D'souza

S3665593

Department of Psychology, University of Groningen

PSB3E-BT15: Bachelor Thesis

Group 29

Supervisor: dr. Ineke Wessel

Second evaluator: Joyce Hoek

In collaboration with: Emma de Zee, Julia van Alphen, Pia Thiele, and Malin Ordelman

February 14, 2022

A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned.

Abstract

The ongoing discourse since the 1990 memory wars has questioned the veracity of certain beliefs about human memory. A prominent yet highly controversial belief is that certain memories can be repressed and recovered later in life. This concept is especially relevant in therapeutic and legal settings, and for society. Previous research found that subjective experience of recall difficulty can influence one's beliefs about their memory. Metamemory beliefs include judgements about accessibility, completeness, unspecified repression beliefs, specified repression beliefs, and childhood pleasantness. This study aimed to replicate findings and explore the correlation between baseline and post-measure beliefs. Participants (N = 112) were asked to recall either 4 negative childhood memories (easy) or 12 negative childhood memories (difficult). Metamemory beliefs were assessed before and after recall. Subjective difficulty of recall was also reported. Overall, in the 12-memory condition, participants experienced the task difficulty to be greater than those in the 4-memory condition. Specified and unspecified repression on average were statistically different from each other. Between conditions, no significant change from baseline to post measure was found. When conditions were assessed separately, completeness was positively associated with childhood pleasantness, specified repression and unspecified repression. Specified repression was negatively associated with accessibility. The correlation between baseline accessibility and completeness and post-measure repression beliefs and childhood pleasantness did not significantly differ between conditions.

Keywords: metamemory beliefs, repression, recall difficulty, completeness, accessibility, childhood pleasantness

What is the effect of recalling 12 compared to 4 negative childhood memories on metamemory beliefs?

Our fascination with memory dates back to the earliest records of written word (Roediger & Yamashiro, 2019). Memory acts as a vital source of information, framing our understanding of the world and helping us navigate life. It is central to human thought in many ways and fundamentally contributes to an individual's sense of self and experience of life (Wilson & Ross, 2003). While our understanding has advanced since Hermann Ebbinghaus first began studying memory empirically in 1885 (Roediger & Yamashiro, 2019), questions remain about processes underlying memory. In particular, the idea that memories can be repressed and retrieved at a later stage has garnered significant interest, dividing psychologists, laypeople, and other professionals in their views. This carries weight in clinical and academic contexts (Otgaar et al., 2019).

The Concept of Repression

The concept of repression stems from Freud's psychoanalytic theory. He described it as the process by which aversive memories are kept out of one's conscious awareness. (Myers et al., 1992). It is proposed that repression can act as a coping mechanism serving a protective function from traumatic memories (Houben et al., 2021). Based on this, repression can be said to cover three main ideas. Firstly, specifically traumatic memories are subject to repression. Secondly, repressed memories can manifest themselves in the form of mental and/or physical symptoms, and lastly, to alleviate symptoms, the memories must be recovered (Otgaar et al., 2019).

Whether repression occurs consciously or unconsciously is unclear in Freud's work, with the terms often used interchangeably (Myers et al., 1992). The current common belief is that suppression is the conscious effort to forget traumatic memories motivated by the desire to avoid them, whereas repression describes an unconscious act (Hornstein, 1992).

The Recovered Memories Debate

Scepticism about repression grew around the 1990s, marking the beginning of the so-called “memory wars,” a phrase coined by Crews (1995) to describe the strongly polarised debate on the accuracy of repressed memories. This was especially relevant in cases where memories of childhood sexual abuse resurfaced during therapy (Crews, 1995). This raises two critical questions; Is it possible to repress memories, to begin with? If so, how authentic are recovered memories? (Loftus, 1993).

Those in favour describe repression as a coping mechanism for memories of aversive events (Loftus, 1993; Houben et al., 2021). However, studies suggest that traumatic memories are easily retained and retrieved (McNally, 2003). Additionally, research has found that it is relatively easy to implant or induce false memories of events that did not occur (Brewin & Andrews, 2017). It is thus important to consider that some cases of recovered childhood memories of abuse can be false, especially when suggestive therapeutic techniques are used (Loftus, 1993, Ceci and Loftus, 1994).

The idea of repression currently lacks scientific evidence, and experts in the field of memory express a general scepticism (Hayne, Garry, & Loftus, 2006; Patihis et al., 2018). Despite this, a considerable number of practitioners still endorse this idea (Houben et al., 2021; Loftus, 1993; Patihis et al., 2014). In conclusion, it is safe to say that the debate is a long way from being settled and further research is imperative (Otgaar et al., 2019; Patihis et al., 2014).

Metamemory Beliefs

People's beliefs about their memory, as well as how they monitor and control their learning and retrieval, are referred to as metamemory (Dunlosky & Thiede, 2013; Nelson & Narens, 1990). One assumption is that the more memories an individual can recall, the more favourably they will judge their memory capability (Winkielman et al., 1998). However,

Winkielman and colleagues (1998) found a paradoxical effect where participants asked to recall 12 memories judged their memory as poorer compared to those asked to recall 4. An explanation for this is the misattribution of task difficulty based on availability heuristics. People rely on available information to judge their memory, in this case, the subjective experience of recall difficulty (Tversky & Kahneman, 1973; Schwarz et al., 1991).

Experienced recall difficulty also affects how accessible and complete one deems their childhood memories (Merckelbach et al., 2001; Belli et al., 1998; Winkielman et al., 1998). Belli et al., (1998) found that the more events recalled (12 vs. 6), the more participants reported having incomplete memory. Furthermore, Merckelbach et al. (2001) explored ratings of completeness by assessing accessibility and repression beliefs. Participants asked to recall more negative childhood events judged their memory as less accessible but were less likely to believe their memories were repressed. They concluded that the kind of question determines the effect of recall. Questions about repression are more self-relevant and technical causing participants to rely on memory content rather than experienced difficulty (Merckelbach et al., 2001; Schwarz, 1998).

Winkielman and Schwarz (2001) tried to extend their findings beyond frequency related judgements. They wanted to test whether a prompt to recall many childhood events with a suggested metamemory belief was enough to lead to negative inferences of one's childhood. They found that when participants experienced greater recall difficulty (12-memory condition) and were made to believe that unpleasant childhood events are difficult to remember, they rated their childhood as less pleasant. This has implications in therapy where individuals may incorrectly conclude their childhood was unhappy (Winkielman & Schwarz, 2001).

The illustrated findings are important for understanding processes that may underly beliefs about memory. For a master's project at the University of Groningen, Wessel et al.,

(2020) conducted a conceptual replication of Winkielman et al. (1998), also building on findings from Winkielman & Schwarz (2001), and Merckelbach et al. (2001). They were not successful in replicating previous findings. Additionally, no support was found for the possible moderation of repression beliefs between difficulty and childhood pleasantness (Wessel et al., 2020).

The Present Study

Previous studies suggest that difficulty of recall influences judgements of memory accessibility, how complete memory is, whether their memories have or can be repressed and how pleasant their childhood was. In general, number of recalled memories is related to difficulty (Winkielman et al., 1998; Belli et al., 1998; Merckelbach et al., 2001; Winkielman & Schwarz, 2001).

The present study is a conceptual replication of Wessel et al., (2020). Methodology in this study will largely be based on the master's project. The aim is to replicate findings from Wessel et al. (1998), Winkielman & Schwarz (2001), Merckelbach et al. (2001), and Belli et al. (1998). Psychology as a field is currently in a replication crisis, with an overreporting of spurious effects and a lack of replication studies (Maxwell et al., 2015). In light of this, it is important to validate previous findings.

The second goal is to assess how baseline metamemory beliefs change after experiencing recall difficulty. The affective tone will be suggested like in Merckelbach et al. (2001). Both of the above was not done in Wessel et al. (2020). In this study, participants will rate their baseline accessibility, completeness, childhood pleasantness and repression beliefs. Repression will use two operationalisations: a general belief called unspecified repression and repression related to symptomatology called specified repression. Participants will recall either 4 or 12 negative childhood memories and rate the difficulty. Baseline questions will be

asked again as a post-test measure. The research question is: What is the effect of recalling 12 compared to 4 negative childhood memories on metamemory beliefs?

The first expectation is that regardless of condition, participants will score higher on unspecified than specified repression beliefs. Merckelbach et al. (2001) only measured unspecified repression. While Wessel et al. (2020) found that unspecified repression mediated the relationship between difficulty and childhood pleasantness, it did not significantly differ from specified repression. It is important to establish if the two variables differ.

Belli et al. (1998) & Merckelbach et al. (2001) found that greater recall difficulty led to judgements of incomplete and inaccessible memories, respectively. Participants in the 12-memory conditions will be compared to those in the 4 condition. Our second expectation is those who recalled 12 memories would report a larger decline in childhood memory accessibility.

Merckelbach et al. (2001) found that participants were less likely to believe their memories are repressed when they recalled more. This result has not been replicated, therefore we hypothesise that participants in the 12 condition will show an increase in agreement with statements implying their childhood memories are repressed.

Lastly, Winkielman & Schwarz (2001) found that childhood pleasantness was negatively associated with difficulty. In line with this, we expect participants recalling 12 memories will report a greater reduction in their childhood pleasantness.

The study further aims to investigate how default beliefs about accessibility and completeness are associated with post-measure childhood pleasantness and repression, accounting for task difficulty. This was based on multiple rationales. Firstly, Winkielman et al. (1998) suggested that individuals misattribute the experience of task difficulty to their memory judgements. Secondly, the task of recalling many negative childhood events leads to

inferences of a less pleasant childhood (Winkielman & Schwarz, 2001). Lastly, Merckelbach et al. (2001) found no correlation between accessibility and ratings of repression. This finding has not been replicated. Considering the above, we expect that when participants recall more memories, baseline accessibility and completeness will be more positively associated with beliefs that their memories are repressed, and more negatively associated with childhood pleasantness.

Methods

Participants

A total of 128 first-year Psychology students were recruited from the Dutch and English track at University of Groningen. Recruitment was done via the SONA participant system. This was a requirement of the first-year course ‘‘A Practical Introduction to Research Methods.’’ Students received study credits for their participation. The study received approval from the Ethics Committee of Psychology (ECP) of the University of Groningen.

Out of 128 participants, 13 failed the attention checks, and 3 did not consent. These participants were excluded, resulting in a sample size of 112. In the final sample ($N = 112$), 24.1% identified as male, 75% as female, and 0.9% as non-binary. Mean age of participants was 19.92 years ($SD = 2.15$), ranging from 17 to 31.

Research Design

This study followed a 2x2 mixed experimental design conducted using an online questionnaire. Participants were randomly assigned to one of two conditions (4 or 12 negative memories). Number of memories recalled was the between-subjects factor. They were measured on six characteristics, first at baseline, and then following the recall task. Time was the within-subjects factor. The dependent variables included difficulty of recall, accessibility and completeness of memory, repression beliefs (unspecified and specified) and childhood pleasantness. For exploratory purposes, the role of accessibility and completeness was further

analysed concerning repression beliefs and childhood pleasantness between the two conditions.

Power Analysis

An a priori power analysis was performed using G*Power software (Faul et al., 2007). This revealed the desired sample size of 266. Six tests were to be performed in this study. After correcting for multiple testing, the one-tailed adjusted alpha was set at 0.008 (.05/6). The aim was to detect the moderate effect size of $d = 0.5$ (Cohen, 1992). Further, we determined that high power of 0.95 would be appropriate to decrease the chance of a type II error, taking into consideration the replicative nature of this study.

A sensitivity analysis was done on the new sample size of 112. At an alpha level of $p < 0.008$, and a power of 0.95, the new minimally detectable effect size was $d = 0.78$ ($t^* = 2.45$).

Materials

Pre-measure

Before experimental manipulation, participants baseline metamemory beliefs were measured using a 12 item questionnaire. This included an attention check embedded among other items to check for careless responding. The items assessed the variables accessibility, completeness, repression (unspecified and specified), and childhood pleasantness.

Accessibility. Based on Merckelbach et al. (2001) the item “Many of my childhood memories are difficult to access.” was used to assess participants' judgement of how accessible their memory is. The response used a visual analogue scale (VAS) from strongly disagree (0) to strongly agree (100). The higher the score, the less accessible they believed their childhood memory to be.

Completeness. Completeness of memory was measured using the item “Regarding my childhood memory, there are large parts of my childhood after the age of 5 that I can't

remember.” This was a categorical response question (Yes, No and Unsure) from Winkielman et al., (1998), adapted to a visual analogue scale (0 = strongly disagree, 100 = strongly agree). The higher the score, the more incomplete they believed their childhood memory to be.

Unspecified Repression. Repression was divided into two variables. The first contained one item about a generic repression belief about the participant’s memory. The item was “I have repressed many of my childhood memories” (VAS; 0 = strongly disagree, 100 = strongly agree) (Merckelbach et al., 2001).

Specified Repression. Specified repression beliefs were assessed using 3 items adapted from the Memory Assumptions Questionnaire previously used by Houben et al., (2021) (Appendix A). All items used a visual analogue scale (0 = strongly disagree, 100 = strongly agree). The scale had good internal consistency at baseline ($\alpha = .80$) and at post-measure ($\alpha = .82$).

Childhood Pleasantness. Five items were used to measure how pleasant participants perceived their childhood to be (Appendix A). These were obtained from a study by Winkielman and Schwarz (2001). A visual analogue scale was used for all items. The first was from very unpleasant (0) to very pleasant (100), while the remaining four were from almost never (0) to very often (100). Items on this scale had a high reliability at baseline ($\alpha = .86$) and at post-measure ($\alpha = .90$).

Attention Check. Participants were asked to move the slider to the very right end of the scale (100).

Memory Recall Task

The difficulty of recall was manipulated by asking participants to recall either 4 or 12 negative childhood memories. Open questions were used asking for negative memories from

ages 5 to 7, and 8 to 10 (Appendix A). From each age range, they were asked to recall two negative memories in the 4 memories condition, and six in the 12 memories condition.

Manipulation Check

The difficulty of the memory recall task was measured by asking participants ‘‘How difficult was the task for you?’’ (VAS; 0 = extremely easy, 100 = extremely difficult) (Belli et al., 1998).

Post-measure

To assess metamemory beliefs after manipulation, the same 12 items from the pre-measure were used.

Procedure

The survey was built and administered online using Qualtrics (Qualtrics, Provo, UT). Participants received a research information form stating the purpose of the study, what the experiment would look like, how their data would be used and any posed risks or benefits to them. They were provided with means to contact researchers with any concerns or questions. It was emphasized that the negative nature of the recall task may be an uncomfortable experience for some. They were discouraged from continuing if they felt this could apply to them. It was also stated that excessive detail or personal information was not required in the task. They were made aware of their rights as participants and were asked for their informed consent.

All participants were first asked to complete a questionnaire about their metamemory beliefs (pre-measure). Once this was done, through the randomizer function in Qualtrics (Qualtrics, Provo, UT), participants were assigned to either the 4 memories or 12 memories condition at random. After the recall task, participants were asked to rate how difficult they found the task to test if the manipulation worked. They were then asked to answer questions about their metamemory beliefs again (post-measure). To ensure that all participants were

capable of recalling 12 negative childhood memories, those in the 4-memory condition were asked to recall an additional 8 memories.

Demographic data such as their age in years and gender was collected. The participants were then debriefed about the true aim and purpose of the study. Resources such as the Student Service Centre contact details were offered in case any support after the fact was needed. Participants were given the opportunity to make further comments or recommendations in the questionnaire or to contact one of the researchers via email if they still had questions.

Statement of Transparency

Before beginning data collection, this study was preregistered on the Open Science Framework platform (OSF). This can be accessed through https://osf.io/64ud9/?view_only=f8eaa839e1a4409fab2709c7d417645f. In addition, all relevant materials and anonymised data will be published once the project is complete.

It is important to mention a minor deviation from this. The first hypothesis initially stated that “regardless of condition, all participants score higher on unspecified than specified repression beliefs.” This was later changed by removing “all” to imply a more general rather than definitive expectation. The new hypothesis states that “regardless of condition, participants will score higher on unspecified than specified repression beliefs.”

Data Analysis

The data analysis was done using IBM SPSS Statistics version 27. For the study, data collection was terminated on January 1st 2022, at a sample size of 128, as opposed to the desired sample size of 266. As stated in the preregistration, the exclusion criteria used were; 1) missing consent and 2) failed attention checks. For the attention check, a cut-off score of > 95 was used. Three participants did not consent and 13 failed the attention checks resulting in 16 excluded from the dataset. Participants that failed attention checks and did not enter any

memories were excluded by default. Scores that fell below the first quartile or above the third quartile of 1.5x Interquartile Range were considered outliers. Boxplots revealed outliers for change scores on accessibility (N = 2), completeness (N = 3), specified repression (N = 5), unspecified repression (N = 9) and pleasantness (N = 7). Additionally, unspecified repression, specified repression and pleasantness also had one extreme value each (N = 3). Overall, four variables had a common outlier resulting in a total of 25 participants considered outliers. The data was analysed with (N = 112) and without outliers (N = 87). The two conditions did not have statistically significant change scores for any of the variables in either of the datasets. The outliers were therefore included in the final analysis. The analysis with outliers is displayed in Tables 1, 2 and 3, and the analysis excluding the outliers can be found in Appendix B.

Participants in the 4-memory condition were asked to recall an additional 8 memories. The initial idea was that if all participants could recall 12 memories, we would have a better basis to determine the effectiveness of manipulating difficulty. We found that 56 out of 112 participants did not fill in all 12 memories. Two analyses were conducted, one including all participants (Table 1, 2 & 3) and one with only those that filled in all 12 memories (Appendix B). There was no considerable difference in statistical significance between the two datasets. Data from these participants were included in the final analysis. Excluding these participants could potentially bias the results as participants may have still experienced the task difficulty regardless of whether all memories were reported. By excluding such participants we could risk excluding valuable data.

The amount of time to complete the study was estimated at a range of 45-60 minutes. On analysing the data, we observed that the duration largely varied. The range was from 15 to 7129.97 minutes with an average of 173.4 minutes. We decided that it would not be appropriate to exclude participants that more or less than the estimated time to complete the

study. No substantial rationale was found to establish criteria for this. These participants had filled in all the responses appropriately, thus, excluding them could potentially bias the results. Furthermore, there was one double participation, the first attempt with no memories reported and the second attempt being incomplete. The decision was made to include this participant as those that did not fill in all 12 memories were also not excluded from the analysis. This was also done in keeping with the preregistration to avoid any deviations from the exclusion criteria.

For the analysis, 15 new variables were computed in SPSS. Firstly, Unspecified Repression was calculated by averaging the pre and post-test scores on the one item. Then, specified Repression was calculated by taking the mean score of the three items, averaged over the pre and post-test. This was relevant for the first hypothesis, where we wanted to test whether overall unspecified repression scores would be higher than specified. The two average repression variables were subject to a one-tailed Paired samples t-test. The normality assumption was not violated (Appendix C).

Two variables were computed for childhood pleasantness. Items 2 and 4 differed in valence and were mirrored. The 5 items were then averaged at baseline and post-measure. A change score was computed by subtracting mean baseline from mean pre-measure scores to test hypothesis 4. To address hypothesis 2, change scores were calculated for accessibility and completeness by subtracting baseline scores from post measure scores for each variable respectively. Accessibility and completeness were treated as separate variables. Additionally, change scores for average specified repression and unspecified repression were calculated to test the third hypothesis. All variables of interest followed an approximately normal distribution, see *Figure C7* and *C8* in Appendix C.

To test hypotheses 2-4, all calculated change scores were subject to a one-tailed Welch t-test ($p < 0.008$). An additional Welch t-test ($p < 0.008$) was conducted to assess if

the experimental manipulation of difficulty was successful. Condition (4 or 12) was set as the grouping variable for all tests.

To test the exploratory hypothesis, the intention was to compute one-tailed Pearson correlation coefficients. The variables of interest were baseline accessibility, baseline completeness, post measure unspecified repression, post measure specific repression and post measure childhood pleasantness. The childhood pleasantness variable had an influential outlier, violating the Pearson correlation assumption (*Figure D1*). An analysis with the outlier showed a non-significant correlation between completeness and pleasantness in the 12-memory condition, $r(54) = .17, p < 0.05$. Excluding the outlier resulted in a significant positive correlation, $r(53) = .24, p < 0.05$. Scatter Plots are displayed in Appendix D, *Figure D2* and *D3*. The Spearman's rank correlation is robust to outliers and was used instead. Correlation coefficients were computed regardless of condition to look for any noteworthy associations. Correlations for each condition were computed and Fisher-z transformations were performed to compare differences between conditions.

Results

In this section, the results reported for 4 main hypotheses will use the alpha $\alpha = 0.008$ calculated after correcting for multiple testing ($\alpha = 0.05/6$). For exploratory purposes, an alpha of $\alpha = 0.05$ will be used. Mean scores used to calculate change scores are summarised in Appendix E for descriptive purposes.

Manipulation of Difficulty

Participants in the 12-memory condition experienced the recall task as considerably more difficult than participants in 4-memory condition. The difference between the two conditions was found to be statistically significant with a moderate effect size (Table 1).

Table 1

Independent Sample Welch Test on Difficulty of Recall

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>		<i>SD</i>		<i>Cohen's d</i>
				4-Memories (N = 56)	12-Memories (N = 56)			
Difficulty	-4.51	107.49	.000*	51.11	24.40	70.48	20.92	-0.85

* $p < 0.008$ (1-tailed)

Hypothesis 1

It was expected that regardless of condition, participants would in general score higher on unspecified than specified repression beliefs. The paired samples t-test showed a significant difference in mean scores between specified and unspecified repression, with a good effect size. On average, participants scored higher on specified repression than on unspecified repression (Table 2).

Table 2

Paired Samples T-test on Mean Repression Beliefs

Variable	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>sig. (1-tailed)</i>	<i>Cohen's d</i>
Pair Unspecified Repression	36.07	24.47	4.94	111	.000*	0.47
Specified Repression	47.32	22.98				

* $p < 0.008$

Hypothesis 2

The second hypothesis stated that participants asked to recall 12 memories, would report a larger decline in their childhood memory accessibility, compared to those that recalled 4. A Welch t-test revealed that on accessibility and completeness, difference between pre and post measure scores was not statistically significant, with a small and moderate effect size, respectively (Table 3).

Hypothesis 3

With regards to the third hypothesis, the expectation was that participants asked to recall 12 compared to 4 memories, would show an increase in agreement with statements implying the idea that their childhood memories are repressed. A Welch t-test was conducted on the two types of repression variables. On both the repression beliefs, the difference between groups across the baseline and post measure was not statistically significant. Unspecified repression had a small to moderate effect size and specified repression had a very small effect size. (Table 3).

Hypothesis 4

The fourth hypothesis stated that participants asked to recall 12 memories, would report a larger reduction in their childhood pleasantness, compared to those asked to recall 4. The Welch T-test for childhood pleasantness revealed that both conditions did not significantly differ with a very small effect size (Table 3).

Table 3

Independent Samples Welch Test on Change in Metamemory Beliefs

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>	<i>SD</i>			<i>Cohen's d</i>
						4-Memories (N = 56)	12-Memories (N = 56)	
Accessibility	-1.44	109.78	.08	3.91	21.25	9.84	22.23	-0.27
Completeness	-1.93	107.21	.03	3.84	21.90	11.27	18.61	-0.37
Unspecified Repression	-2.02	104.92	.02	2.91	22.61	10.73	18.08	-0.38
Specified Repression	-0.39	89.06	.35	1.22	11.38	2.38	19.32	-0.07
Childhood Pleasantness	0.45	88.01	.33	-0.36	5.10	-0.97	8.84	0.09

* $p < 0.008$ (1-tailed)

Note. Change is calculated by Post - Pre.

Exploratory Analysis

It was expected that participants whom prior to the task believed their memory to be more accessible and complete 1) would agree more with statements that their childhood memories are repressed in the 12 compared to the 4-memory condition & 2) would rate their childhood pleasantness to be lower in the 12 compared to the 4-memory condition.

First, to observe any possible associations and patterns between variables, Spearman's rank correlations were calculated for the variables specified repression, unspecified repression, and childhood pleasantness at post measure, and accessibility and completeness at baseline (Table D1, Appendix D). Scatter plots were built to visualise these associations (Appendix D). Specified repression was only weakly negatively associated with accessibility and weakly positively associated with completeness. Unspecified repression and accessibility were weakly positively associated. Lastly, childhood pleasantness had a weak negative association with accessibility and a weak positive association with completeness. The only statistically significant association was between unspecified repression and completeness. The two variables were weakly positively associated (Table D1).

To further test the hypothesis, Spearman's rank correlations were computed per condition (Table D2), followed by Fisher z-transformation to test differences in correlation between conditions (Table D3). To address the first part of the hypothesis, a moderate significant negative association was found between baseline accessibility and specified repression in the 12-memory condition. On the other hand, in the 4-memory condition, only a weak positive correlation was found between variables (Table D2). The difference in correlation between conditions was not statistically significant (Table D3).

Baseline accessibility and unspecified repression had a weak negative association in the 12-memory condition and a moderate positive significant association in the 4-memory

condition (Table D2). The difference in correlation between conditions was not statistically significant (Table D3).

In the 12-memory condition, baseline completeness and specified repression had a weak negative correlation, whereas, in the 4-memory condition, a moderate positive association was observed and was statistically significant. The difference between conditions was statistically non-significant. Unspecified repression and completeness had a weak positive correlation in the 12-memory condition and a significant moderate positive correlation in the 4-memory condition (Table D2). The difference was not statistically significant (Table D3).

The second part of the hypothesis pertained to childhood pleasantness. In the 12-memory condition, a significant moderate positive association was found with completeness and a weak positive association with accessibility. Contrastingly, completeness and accessibility were both negatively associated (weak) with childhood pleasantness in the 4-memory condition (Table D2). The difference for both accessibility and completeness between conditions was not statistically significant (Table D3).

Discussion

Aim of the Study

The purpose of the present study was to understand how metamemory beliefs may change after recalling several negative childhood events. This was done by assessing these beliefs at baseline and after memory retrieval. Furthermore, the study aimed to integrate ideas and methods and replicate findings from previous similar studies (Wessel et al., 2020; Winkielman & Schwarz 1998; Winkielman et al., 2001; and Merckelbach et al., 2001). This is especially relevant in light of the replication crisis.

Results in Light of the Hypotheses

Overall, we found some evidence that number of recalled memories is associated with difficulty, with a moderate effect size. The next finding was that regardless of condition, participants showed a greater statistically significant endorsement for specified repression beliefs rather than unspecified repression beliefs with a small effect size. This contradicted our first hypothesis, where we expected unspecified repression to be greater. With regards to hypotheses 2, 3 and 4, no statistically significant difference of change scores was found between groups, all of which had relatively small effect sizes. For all five variables, the mean change was slightly larger when task difficulty was higher. Therefore, the data did not support any of the 4 hypotheses.

The above findings are indicated with low power considering they are statistically non-significant and the desired sample size was not reached. The initially set power of .95 was not reached meaning the power to detect a difference was low. This is important to note when interpreting and making any conclusions based on these results.

Results from the exploratory analysis did not support the hypotheses. Some noteworthy findings were the positive association between unspecified repression and completeness. Additionally, in the 4-memory condition, both types of repression were positively associated with completeness, and unspecified repression was positively associated with accessibility. In the 12-memory condition, specified repression was negatively associated with accessibility and childhood pleasantness was positively correlated with completeness. It is essential to mention this analysis was only conducted for exploratory purposes and significance should not be interpreted too literally.

Discussion in Light of Previous Empirical Findings

Like Wessel et al. (2020), we were unable to replicate previous findings that recall difficulty significantly influences metamemory beliefs (Merckelbach et al., 2001; Belli et al., 1998; Winkielman et al., 1998). It is important to note that we used mean change scores

whereas previous ones used absolute scores. Comparisons should therefore be made with caution. In our study, the mean change scores for accessibility, completeness, unspecified repression, specified repression, and childhood pleasantness were higher when difficulty was greater, however, the difference was not significant with a small effect size. Merckelbach et al. (2001) found participants experiencing greater recall difficulty judged their memory as less accessible. The same was found with memory completeness (Belli et al., 1998 & Winkielman et al., 1998). Winkielman & Schwarz (2001) found that when participants believe unpleasant memories are repressed and experience recall difficulty, they infer an unpleasant childhood. Repression beliefs were not manipulated in this study and Wessel et al., (2020). Our findings are in line with the idea that to influence judgement of childhood pleasantness, difficulty itself is not enough (Winkielman & Schwarz, 2001). Merckelbach et al., (2001) found no correlation between repression and accessibility. Contradictory to this, we found that the more incomplete memory was deemed, the more participants believed their memories were repressed.

Theoretical Implications

It could be that participants in our study relied on the content of their memories rather than the task difficulty thereby yielding non-significant differences between conditions (Merckelbach et al. 2001). This relates to the idea that metamemory judgements rely on two sources of information: the content of memories or ease with which content is recalled (Winkielman et al., 1998; Schwarz et al., 1998). Furthermore, there is evidently an ongoing struggle to operationalise repression (Otgaar et al., 2019). In this study, Specified and unspecified repression were found to significantly differ. We also found discrepancies in associations between baseline completeness and accessibility and the two repression beliefs. This suggests that there are indeed different conceptualizations of repression.

Limitations and Future Research

Like Wessel et al. (2020), the present study was administered online. Firstly, some participants in the 4-memory condition did not understand that they were expected to fill out an additional 8 memories. This was evident during a case-by-case analysis of responses. In an in-person setting, doubts like this would be cleared out instantly as participants can ask the researchers for clarification. Future research should pay attention to this to rule out any contextual and uncontrolled factors.

In keeping with the preregistration, participants who had incomplete memories were included in the analysis. It brings to question what these participants based their experienced task difficulty on. It is possible that the time that data stays in progress on qualtrics was recorded as part of the response duration. This could have explained why in some instances participants took a very long time.

Participants that deviated from the estimated duration were included in the analysis. A caveat is that we cannot be sure of the time span between answering the baseline, memory task, and post-measure questions. This questions the effectiveness of the experimental manipulation. Participants that spent a large amount of time filling in the memories could have rated it easier than if done in a shorter time.

Our study differed from previous ones as we assessed default metamemory beliefs. Despite efforts to disguise the baseline, participants could have noticed the same questions being asked twice. It is not possible to determine how baseline measures influenced experienced task difficulty. More research using this design is needed.

Other considerations include how questions are framed. This can play a role in the effect of retrieval on metamemory judgments. Merzelbach et al. (2001) proposed this as a justification for why paradoxical effects of retrieval were found in Winkielman et al. (1998). Furthermore, with regards to the nonsignificant differences between childhood pleasantness across conditions, Winkielman and Schwarz (2001) suggested the idea that difficulty itself

may not have been enough to influence judgements of childhood pleasantness. Establishing prior repression beliefs may be a necessary addition to observe differences in childhood pleasantness ratings between conditions.

Future studies should suggest an effective tone of memories like in this study. This was only done in Merckelbach et al. (2001). Additionally, more than one valence can be suggested, such as studying both negative and positive by asking participants to recall either of two and then observing any difference in judgements of difficulty and subsequently, metamemory beliefs. Furthermore, specified and unspecified repression needs to be studied further to differentiate between clinical definitions and those generally understood in society. Other conceptualizations apart from the two may also exist. Lastly, a strength was that, unlike previous studies, multiple datasets were analysed instead of simply excluding data. Lastly, instead of simply excluding data like previous studies, we analysed multiple datasets. This speaks for better transparency and replicability.

Conclusion

This study aimed to replicate previous findings suggesting the influence of experienced recall difficulty on metamemory judgements (Belli et al. 1998; Winkielman & Schwarz 1998; Winkielman et al. 2001, and Merckelbach et al. 2001). Overall, we found support for the idea that recalling more memories is associated with greater recall difficulty. Additionally, we found that conceptualisations of repression do indeed differ. We were unsuccessful in replicating the effect of difficulty on beliefs of completeness, accessibility, repression, and childhood pleasantness. Recall difficulty did not have a significant influence on the association between beliefs. Default accessibility and post-measure unspecified repression were only weakly associated. This suggests the need for more replications of studies like this where baseline and post measure beliefs are compared. Further research on metamemory beliefs, specifically repression is also important.

References

- Belli, R. F., Winkielman, P., Read, J. D., Schwarz, N., & Lynn, S. J. (1998). Recalling more childhood events leads to judgments of poorer memory: Implications for the recovered/false memory debate. *Psychonomic Bulletin and Review*, *5*(2), 318–323. <https://doi.org/10.3758/BF03212958>
- Brewin, C. R., & Andrews, B. (2017). Creating memories for false autobiographical events in childhood: A systematic review: Creating false childhood memories. *Applied Cognitive Psychology*, *31*(1), 2–23. <https://doi.org/10.1002/acp.3220>
- Ceci, S. J., & Loftus, E. F. (1994). “Memory work”: A royal road to false memories? *Applied Cognitive Psychology*, *8*(4), 351-364. <https://doi.org/10.1002/acp.2350080405>
- Crews, F. (1995). *The memory wars: Freud’s legacy in dispute*. London, England: Granta Books.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159. Retrieved from <http://www2.psych.ubc.ca/~schaller/528Readings/Cohen1992.pdf>
- Dunlosky, J., & Thiede, K. W. (2013). Metamemory. In D. Reisberg (Ed.), *Handbook of applied cognition* (pp. 137-161). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780195376746.013.0019>
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191. <https://doi.org/10.3758/bf03193146>
- Hornstein, G. A. (1992). The return of the repressed: Psychology’s problematic relations with psychoanalysis, 1909–1960. *American Psychologist*, *47*, 254–263. <https://doi.org/10.1037/0003-066X.47.2.254>
- Houben, S. T. L., Otgaar, H., Roelofs, J., Wessel, I., Patihis, L., & Merckelbach, H. (2021). Eye movement desensitization and reprocessing (EMDR) practitioners’

- beliefs about memory. *Psychology of Consciousness: Theory, Research, and Practice*, 8(3), 258-273. <https://doi.org/10.1037/cns0000211>
- Hayne, H., Garry, M., & Loftus, E. F. (2006). On the continuing lack of scientific evidence for repression. *Behavioral and Brain Sciences*, 29(5), 521–522. <https://doi.org/10.1017/S0140525X06319115>
- Loftus, E. F. (1993). The reality of repressed memories. *American Psychologist*, 48(5), 518–537. <https://doi.org/10.1037/0003-066X.48.5.518>
- Merckelbach, H., Wiers, R., Horselenberg, R., & Wessel, I. (2001). Effects of retrieving childhood events on metamemory judgments depend on the questions you ask. *British Journal of Clinical Psychology*, 40(2), 215-220. <https://doi.org/10.1348/014466501163553>
- Myers, L. B., Brewin, C. R., Power, M. J. (1992) Repression and Autobiographical Memory. In M. A. Conway, D. C. Rubin, H. Spinnler, & W. A. Wagenaar (Eds.) *Theoretical Perspectives on Autobiographical Memory* (pp. 375–390). Springer. https://doi.org/10.1007/978-94-015-7967-4_22
- McNally, R. J. (2003). Recovering memories of trauma: A view from the laboratory. *Current Directions in Psychological Science*, 12, 32-35. <https://doi.org/10.1111/1467-8721.01217>
- Maxwell, S. E., Lau, M. Y., & Howard, G. S. (2015). Is psychology suffering from a replication crisis? What does "failure to replicate" really mean?. *The American psychologist*, 70(6), 487–498. <https://doi.org/10.1037/a0039400>
- Nelson, T., & Narens, L. (1990). Metamemory: a theoretical framework and new findings. In *Psychology of learning and motivation* (Vol. 26, pp. 125–173). Academic Press.
- Otgaar, H., Howe, M. L., Patihis, L., Merckelbach, H., Lynn, S. J., Lilienfeld, S. O., & Loftus, E. F. (2019). The Return of the Repressed: The Persistent and Problematic

Claims of Long-Forgotten Trauma. *Perspectives on Psychological Science*, 14(6), 1072–1095. <https://doi.org/10.1177/1745691619862306>

Patihis, L., Ho, L. Y., Tingen, I. W., Lilienfeld, S. O., & Loftus, E. F. (2014). Are the “memory wars” over? A scientist-practitioner gap in beliefs about memory. *Psychological Science*, 25, 519–530. <https://doi.org/10.1177/0956797613510718>

Qualtrics. (2005). Retrieved from <https://www.qualtrics.com>

Roediger, H., & Yamashiro, J. (2019). Memory. In R. Sternberg & W. Pickren (Eds.). *The Cambridge Handbook of the Intellectual History of Psychology* (Cambridge Handbooks in Psychology, pp. 165-215). Cambridge: Cambridge University Press. [doi:10.1017/9781108290876.008](https://doi.org/10.1017/9781108290876.008)

Schwarz, N., Bless, H., Strack, F., Klumpp, G., Rittenauer-Schatka, H., & Simons, A. (1991). Ease of retrieval as information: Another look at the availability heuristic. *Journal of Personality and Social Psychology*, 61(2), 195–202. <https://doi.org/10.1037/0022-3514.61.2.195>

Schwarz, N. (1998). Accessible content and accessibility experiences: The interplay of declarative and experiential information in judgment. *Personality and Social Psychology Review*, 2(2), 87–99. https://doi.org/https://doi.org/10.1207/s15327957pspr0202_2

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, 5(2), 207–232. [https://doi.org/10.1016/0010-0285\(73\)90033-9](https://doi.org/10.1016/0010-0285(73)90033-9)

Winkielman, P., & Schwarz, N. (2001). How Pleasant Was Your Childhood? Beliefs About Memory Shape Inferences From Experienced Difficulty of Recall. *Psychological Science*, 12(2), 176–179. <https://doi.org/10.1111/1467-9280.00330>

Winkielman, P., Schwarz, N., & Belli, R. F. (1998). The Role of Ease of Retrieval and Attribution in Memory Judgments: Judging Your Memory as Worse Despite Recalling More Events. *Psychological Science*, 9(2), 124-126. <https://doi.org/10.1111/1467-9280.00022>

Wilson, A., & Ross, M. (2003). The identity function of autobiographical memory: Time is on our side. *Memory*, 11(2), 137-149. DOI: [10.1080/741938210](https://doi.org/10.1080/741938210)

Wessel, I., Cesmeli, S. M., Rieken, S., & Niesten, I. (2020, November 16). Effect of Retrieval on Meta Memory. <https://doi.org/10.17605/OSF.IO/WNFVJ>

Appendix A

Specified Repression items

1. “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.”
2. “It is quite possible that certain memories in my unconscious mind cause symptoms.”
3. “It is quite possible that becoming aware (i.e. remembering) of my unconscious memories will lead to a relief from symptoms.”

Childhood Pleasantness items

1. “How pleasant was your childhood?”
2. “How often did you feel sad in your childhood?”
3. “How often did you feel happy in your childhood?”
4. “How often did you feel worried in your childhood?”
5. “How often did you feel carefree in your childhood?”

Memory recall task questions

1. In the space below please write down one negative childhood memory from when you were 5 - 7 years old. 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.
2. In the space below please write down one negative childhood memory from when you were 8 - 10 years old. 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.

Appendix B

Outliers Exclusion Analyses

Table B1

Independent Sample Welch Test on Difficulty of Recall

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>Cohen's d</i>
				4-Memories		12-Memories		
				(N = 44)		(N = 43)		
Difficulty	-3.33	82.76	<.001*	52.07	25.05	68.44	20.72	-0.71

*p<0.008 (1-tailed)

Table B2

Paired Samples T-test on Mean Repression Beliefs

Variable	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>sig. (1-tailed)</i>	<i>Cohen's d</i>
Pair Unspecified Repression	35.32	25.81	4.24	86	.000*	0.46
Specified Repression	46.56	23.20				

*p<0.008

Table B3*Independent Samples Welch Test on Change in Metamemory Beliefs*

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>		<i>SD</i>		<i>Cohen's d</i>
				4-Memories	12-Memories	4-Memories	12-Memories	
				(N = 44)	(N = 43)			
Accessibility	-2.25	83.19	.01	2.00	19.33	10.63	16.27	-0.48
Completeness	-1.96	83.57	.03	1.98	18.82	9.35	16.12	-0.42
Unspecified Repression	-2.56	80.85	.01	0.18	11.53	7.28	14.17	-0.55
Specified Repression	-0.36	82.85	.36	0.06	9.78	0.88	11.24	-0.08
Childhood Pleasantness	0.61	67.10	.27	-0.46	5.27	-1.43	9.08	0.13

* $p < 0.008$ (1-tailed)*Note.* Change is calculated by Post - Pre.**Incomplete 12 Memories Exclusion Analyses****Table B4***Independent Sample Welch Test on Difficulty of Recall*

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>		<i>SD</i>		<i>Cohen's d</i>
				4-Memories	12-Memories	4-Memories	12-Memories	
				(N = 29)	(N = 27)			
Difficulty	-4.26	51.78	.000*	47.03	24.17	71.26	18.18	-1.13

* $p < 0.008$ (1-tailed)

Table B5*Paired Samples T-test on Mean Repression Beliefs*

Variable	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>sig. (1-tailed)</i>	<i>Cohen's d</i>
Pair Unspecified Repression	36.07	24.47	4.94	111	.000*	0.47
Specified Repression	47.32	22.98				

*Note. N = 56** $p < 0.008$ **Table B6***Independent Samples Welch Test on Change in Metamemory Beliefs*

Variable	<i>t</i>	<i>df</i>	<i>sig.</i>	<i>M</i>	<i>SD</i>	<i>M</i>		<i>Cohen's d</i>
						4-Memories (N = 29)	12-Memories (N = 27)	
Accessibility	-1.64	51.36	.05	-0.79	20.68	9.11	24.18	-0.44
Completeness	-1.85	52.71	.04	2.31	25.55	13.67	20.27	-0.49
Unspecified Repression	-1.53	47.31	.07	1.34	27.84	10.78	17.31	-0.41
Specified Repression	-0.57	36.17	.29	1.40	11.92	4.46	25.62	-0.16
Childhood Pleasantness	0.95	33.35	.18	-0.66	5.39	-2.61	10.00	0.26

* $p < 0.008$ (1-tailed)*Note. Change is calculated by Post - Pre.*

Appendix C

Tests for Normality

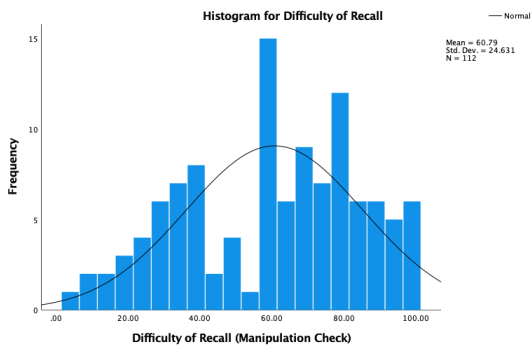


Figure C1. Histogram for difficulty of recall

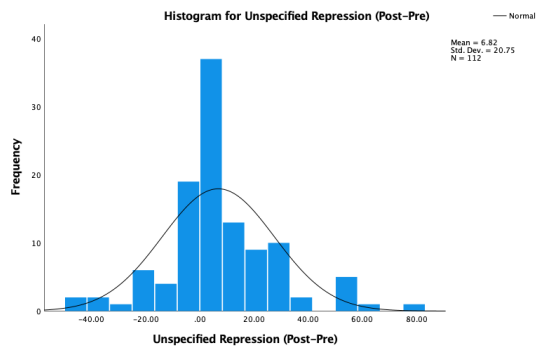


Figure C2. Histogram for unspecified repression mean change (post-pre)

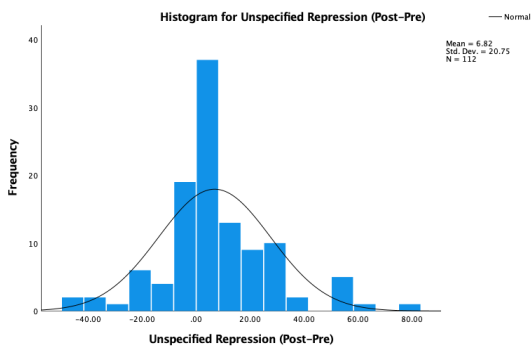


Figure C3. Histogram for specified repression mean change (post-pre)

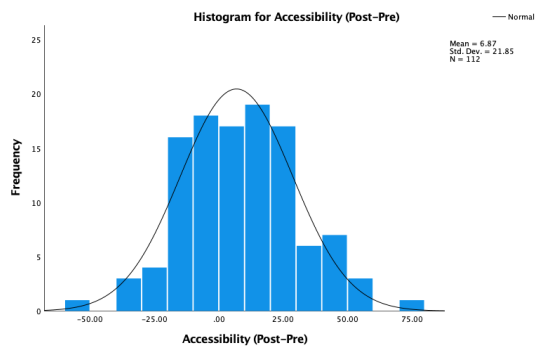


Figure C4. Histogram for accessibility mean change (post-pre)

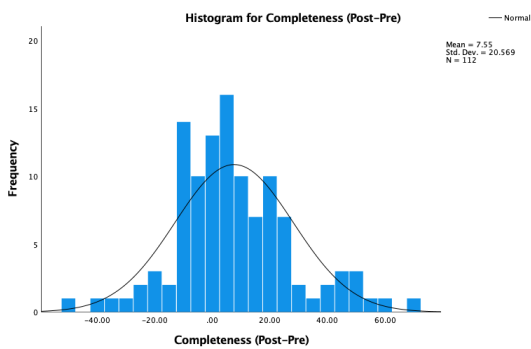


Figure C5. Histogram for completeness mean change (post-pre)

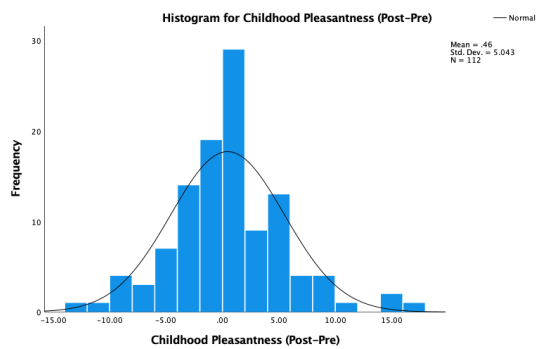


Figure C6. Histogram for childhood pleasantness mean change (post-pre)

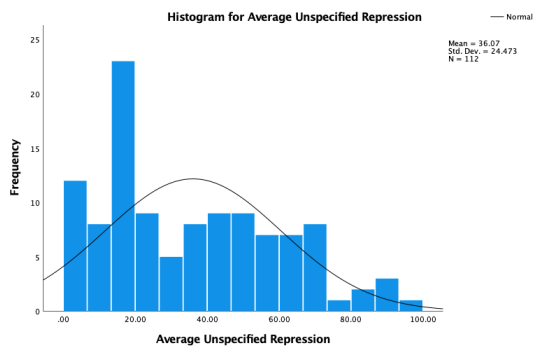


Figure C7. Histogram for average unspecified repression

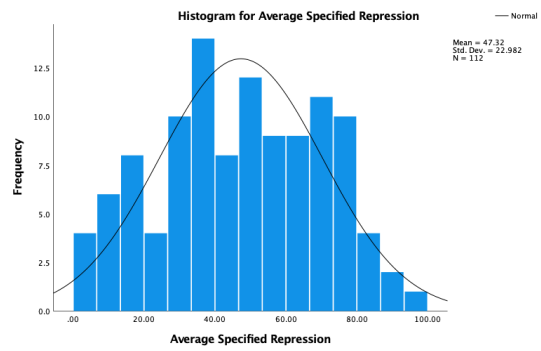


Figure C8. Histogram for average specified repression

Appendix D

Assumption Check for Exploratory Analysis (Influential outliers)

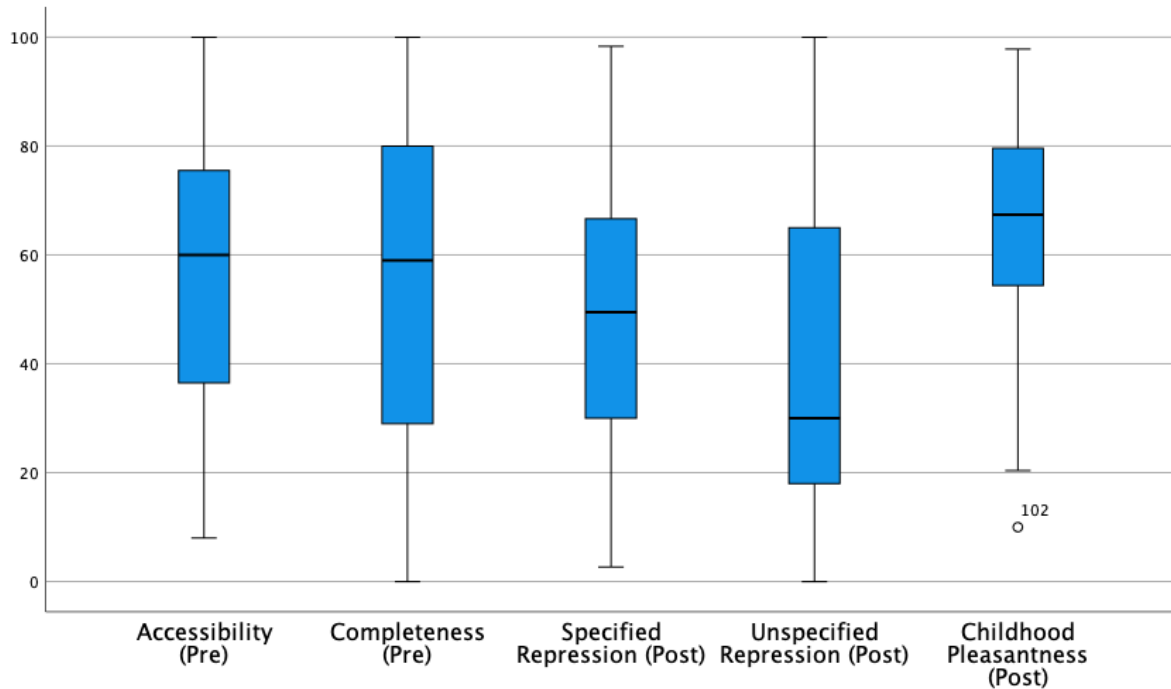


Figure D1. Outlier test using boxplots of variables of interest.

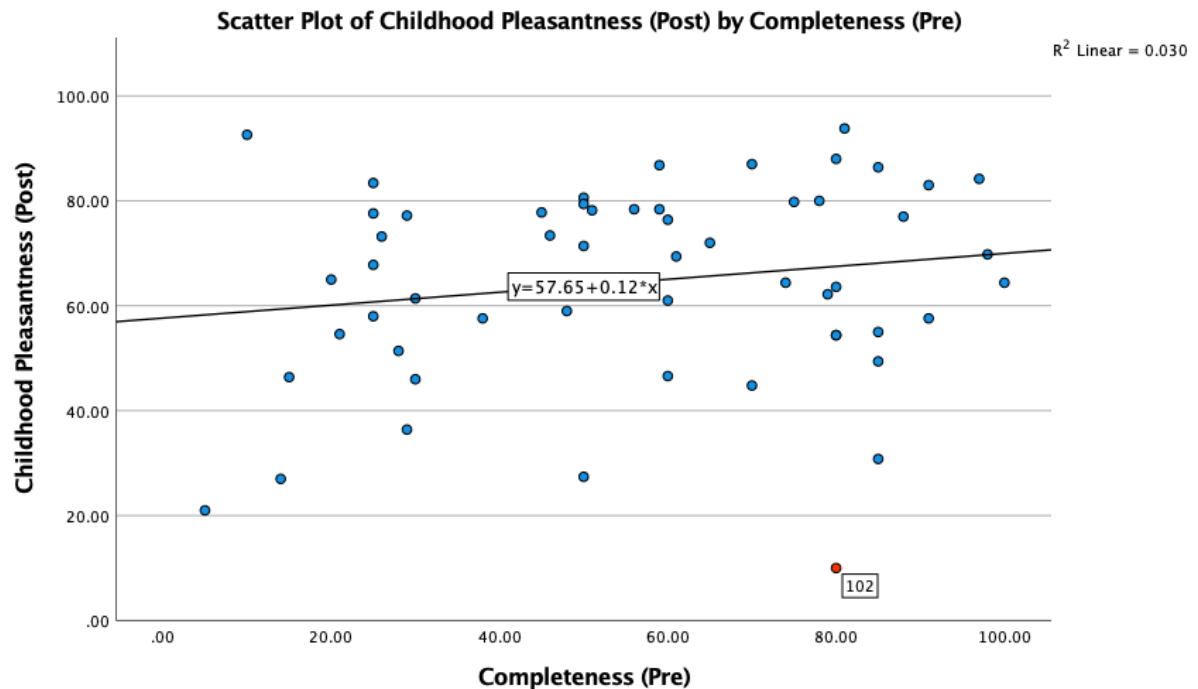


Figure D2. Scatterplot of post-measure childhood pleasantness by baseline completeness in the 12-memory condition including the outlier. The data point has been marked red.

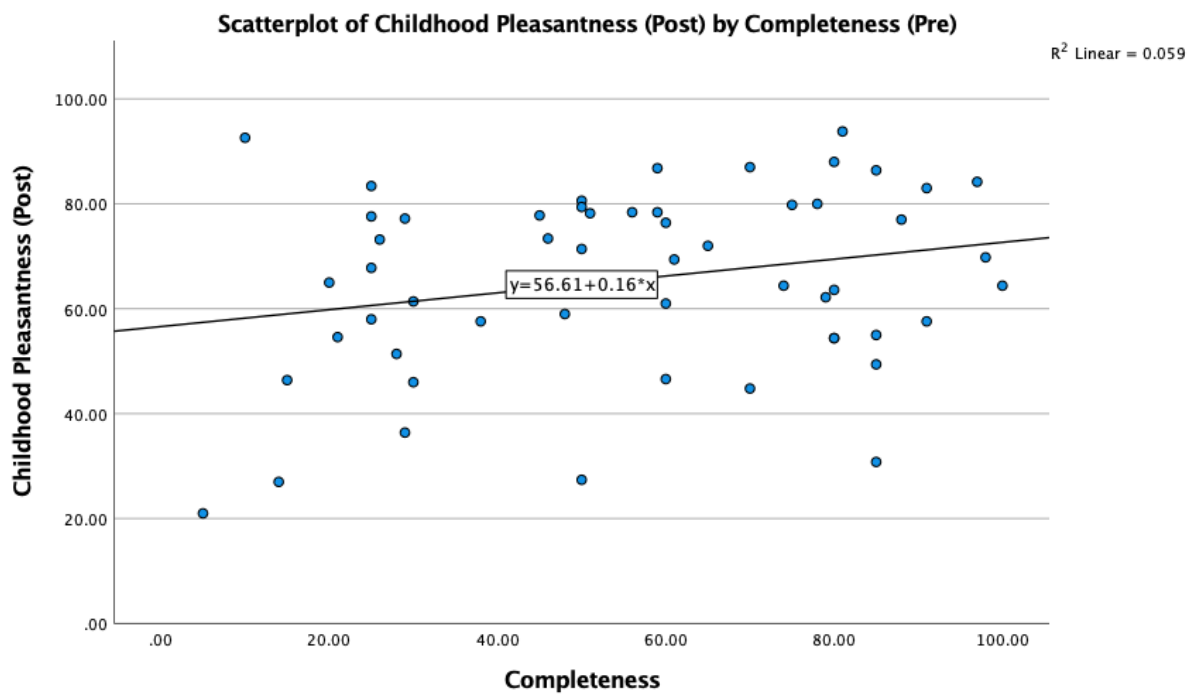


Figure D3. Scatterplot of post-measure childhood pleasantness by baseline completeness in the 12-memory condition excluding the outlier.

Spearman's rank correlation between variables**Table D1***Spearman's Rank Correlation Between Pre and Post Measure Metamemory Beliefs*

Spearman's rho	Accessibility (Pre)		Completeness (Pre)	
	ρ	<i>sig.</i>	ρ	<i>sig.</i>
Specified Repression (Post)	-.06	.27	.11	.12
Unspecified Repression (Post)	.14	.07	.20*	.02
Childhood Pleasantness (Post)	-.03	.38	.01	.48

*Correlation ρ is significant at the 0.05 level (1-tailed).

Table D2*Spearman's Rank Correlation Between Metamemory Beliefs Per Condition*

	4 Memories (56)		12 Memories (56)	
	ρ	<i>sig.</i>	ρ	<i>sig.</i>
Specified Repression (Post) x Accessibility (Pre)	.07	.30	-.27*	.03
Unspecified Repression (Post) x Accessibility (Pre)	.31*	.01	-.02	.46
Childhood Pleasantness (Post) x Accessibility (Pre)	-.19	.09	.18	.10
Specified Repression (Post) x Completeness (Pre)	.25*	.03	-.08	.29
Unspecified Repression (Post) x Completeness (Pre)	.24*	.04	.14	.15
Childhood Pleasantness (Post) x Completeness (Pre)	-.13	.16	.24*	.04

*Correlation ρ is significant at the 0.05 level (1-tailed).

Table D3

Comparison of Correlation Coefficients Between Conditions

	Accessibility (Pre)		Completeness (Pre)	
	<i>z</i>	<i>p</i>	<i>z</i>	<i>p</i>
Specified Repression (Post)	-1.79	0.07	-1.73	0.08
Unspecified Repression (Post)	-1.75	0.08	-0.53	0.60
Childhood Pleasantness (Pre)	1.93	0.05	1.93	0.05

* $p < 0.05$ (2-tailed)

Note. Significance test of differences between correlation coefficients comparing the 12 memory condition ($N = 56$) to the 4 memory condition ($N = 56$).

Scatterplots of the linear relationship between variables, regardless of condition

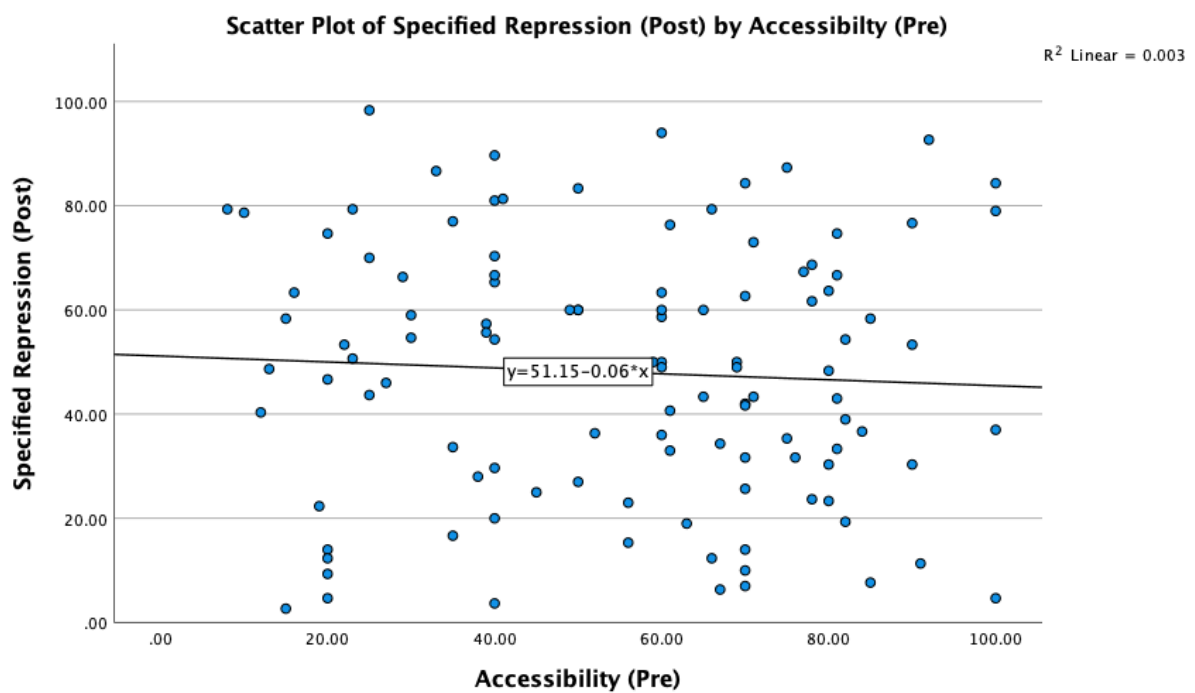


Figure D4. Scatterplot of post-measure specified repression by baseline accessibility.

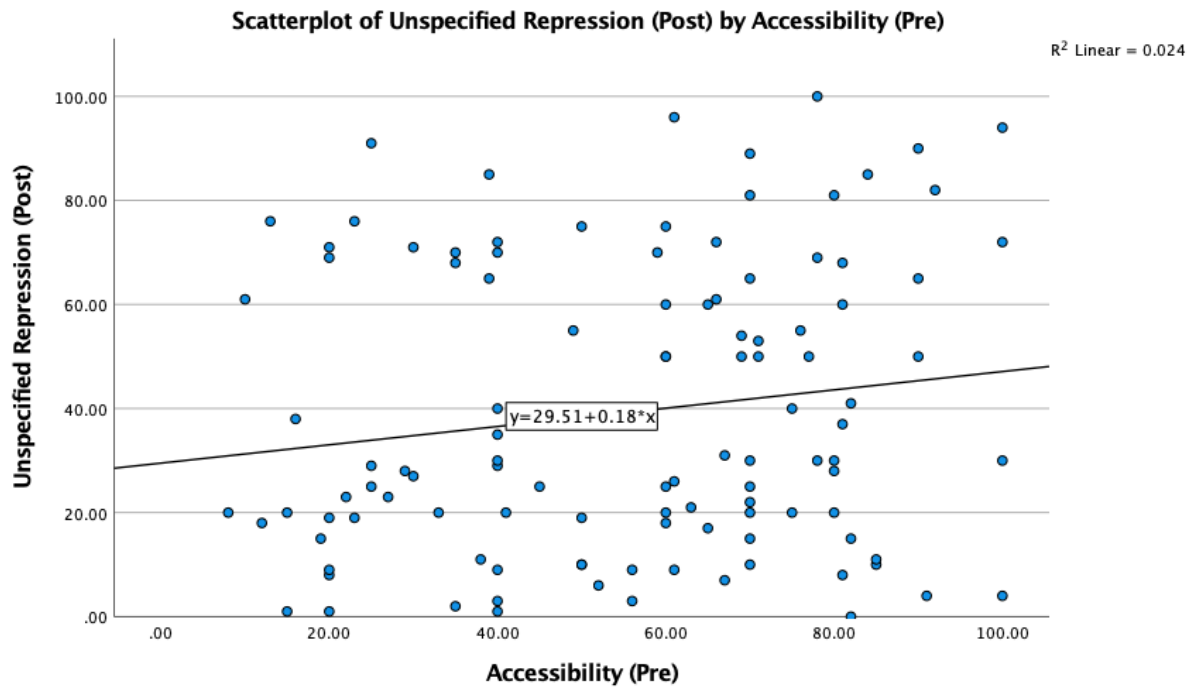


Figure D5. Scatterplot of post-measure unspecified repression by baseline accessibility.

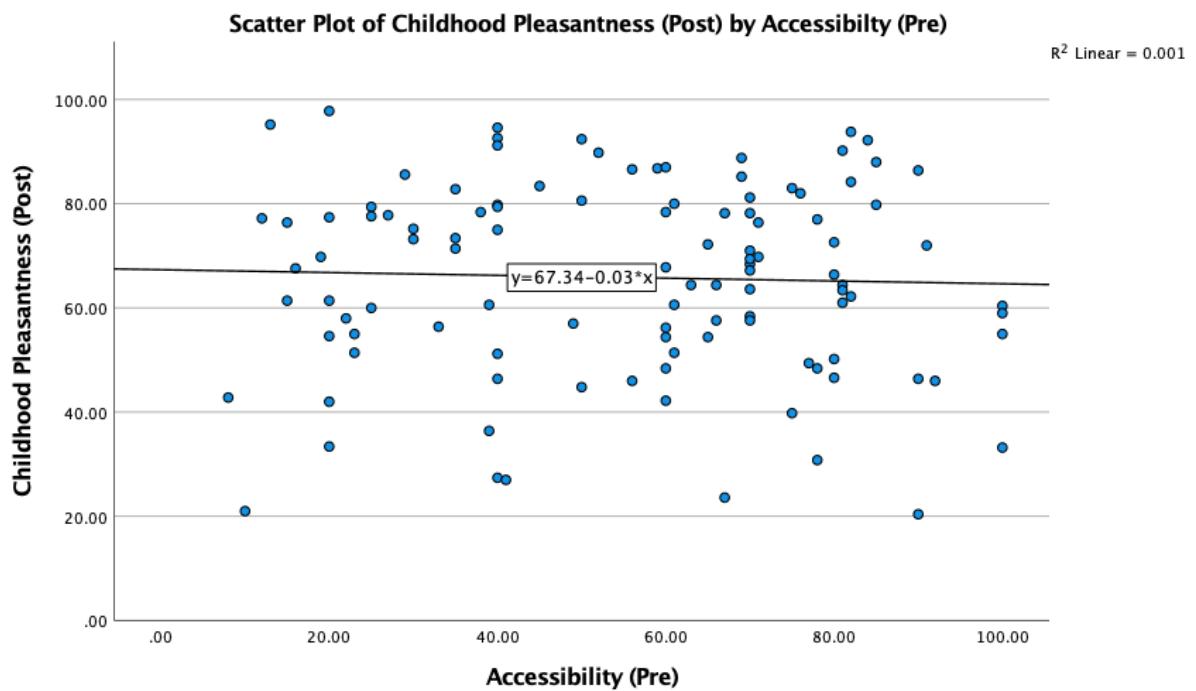


Figure D6. Scatterplot of post-measure childhood pleasantness by baseline accessibility.

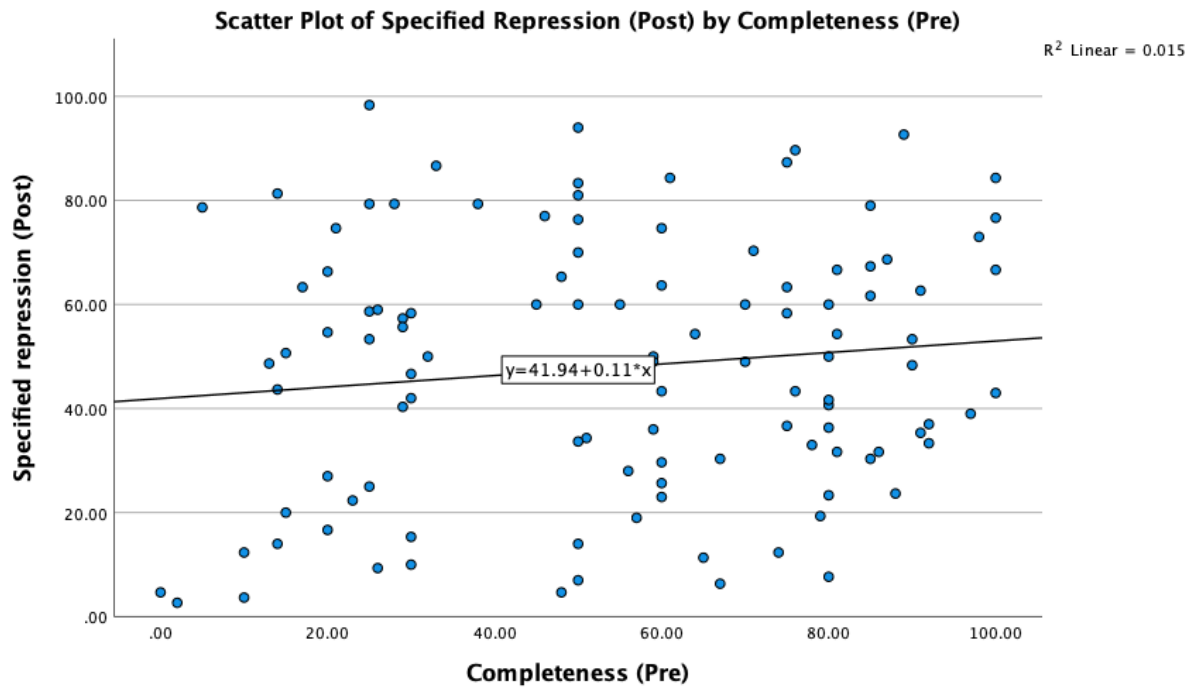


Figure D7. Scatterplot of post-measure specified repression by baseline completeness.

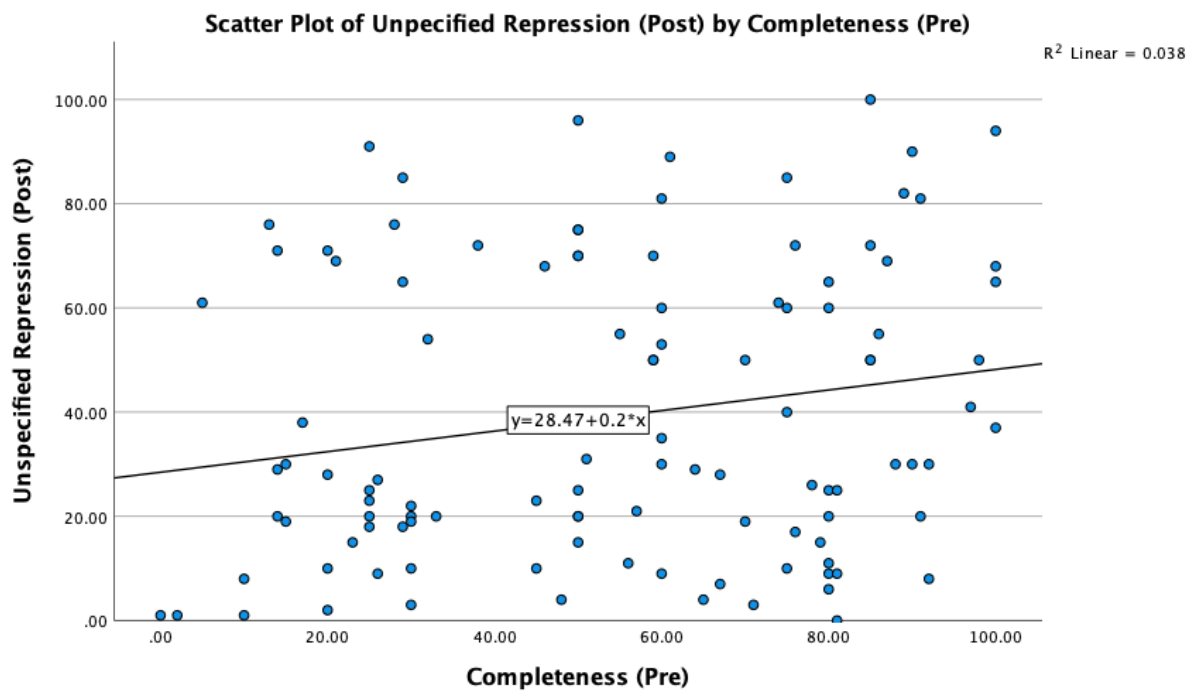


Figure D8. Scatterplot of post-measure unspecified repression by baseline completeness.

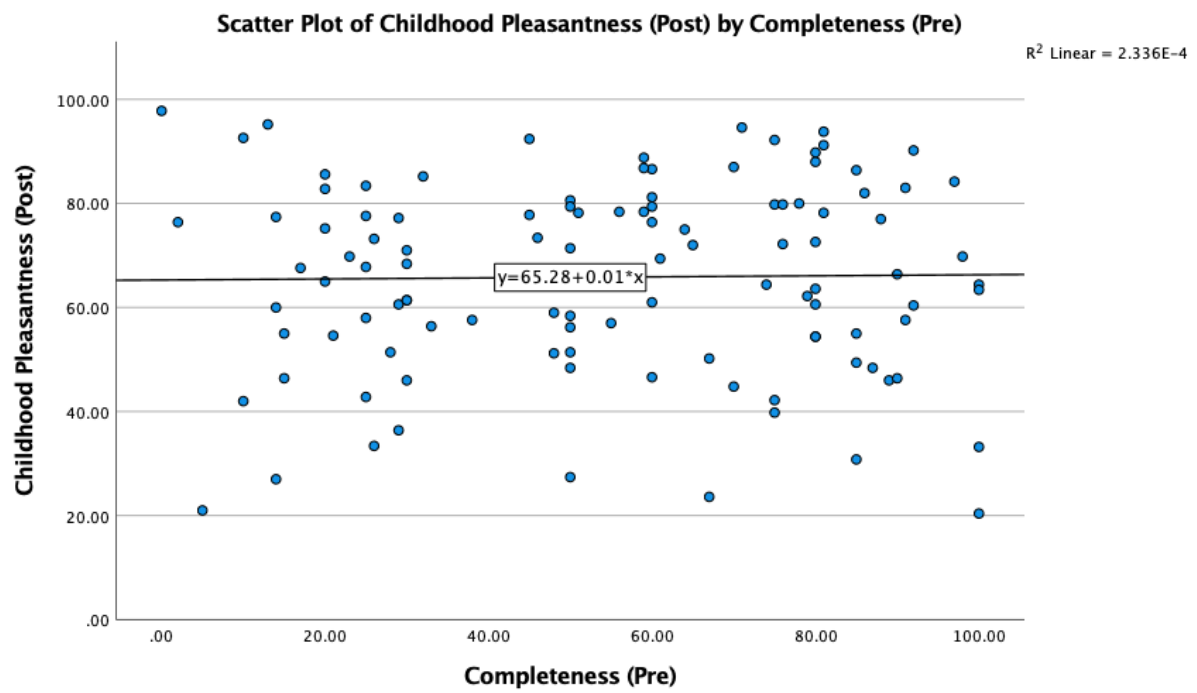


Figure D9. Scatterplot of post-measure childhood pleasantness by baseline completeness.

Appendix E

Raw Mean Scores

Table 1

Mean Scores on Pre and Post Measure Metamemory Belief

Variable	<i>M (SD)</i>		<i>M (SD)</i>	
	4-Memories (N = 56)		12-Memories (N = 56)	
	Pre	Post	Pre	Post
Accessibility	53.77 (25.46)	57.68 (25.07)	57.39 (23.54)	67.23 (23.56)
Completeness	53.83 (29.13)	57.66 (27.28)	56.32 (26.21)	67.59 (25.34)
Unspecified Repression	33.21 (27.40)	36.13 (28.11)	32.11 (23.16)	42.84 (27.40)
Specified Repression	45.08 (25.22)	46.30 (25.17)	47.77 (22.74)	50.14 (24.20)
Childhood Pleasantness	56.80 (6.97)	56.89 (7.77)	57.91 (8.85)	58.74 (9.12)