The relationship between suppression-induced forgetting, repressive coping, and self-reported well-being

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Abstract

Using the Think/No-Think paradigm, research aims to find support for the theory that suppressing the retrieval of a memory leads to an impeded recall ability of this memory (i.e., suppression induced forgetting). Additionally, TNT literature has suggested that individual differences influence the ability to suppress thoughts successfully. While individuals suffering from mental disorders have shown less suppression-induced forgetting, repressive copers showed increased forgetting upon suppression, suggesting that suppression may be a typical mechanism used by repressors. The current study aimed to replicate suppression-induced forgetting using the TNT experiment to investigate the relationship between repressive coping (ISE-score calculated of scores on the Marlow-Crown Social Desirability Scale and the Taylor Manifest Anxiety Scale), suppression-induced forgetting, and self-reported well-being (Psychological well-being scale). More specifically, our objective was to investigate our theory that SIF mediates the suggested positive relationship between repressive coping and well-being. The results we anticipated could have supported the disputed notion that theorizes that adopting a repressive coping style may be a beneficial way of coping, that promotes well-being and protects against psychological disorders. Our sample consisted of six male and 24 female undergraduates. Results: We could not find suppression-induced forgetting in our sample. We did find a significant relationship between repressive coping and self-reported well-being, but no indices for a mediating effect of suppression-induced forgetting for this relationship. Decisive limitations are discussed, and several future considerations for the assessment of suppression-induced forgetting in general and in repressor populations are proposed.

Keywords: Suppression-induced forgetting, Think-/No think, Repressive coping style, Well-being

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During the 1990s, one of the most heated debates in modern psychology arose. It concerns the existence of repressed memories, which are theorized to be traumatic memories stored in the inaccessible unconscious with the consequence that an individual cannot recall these memories (Garssen, 2007; Otgaar et al., 2019). Cases like Nicole Kluemper are, to this day, splitting the psychological community. As a child, Kluemper reported being abused by her mother. Years later, she could recall neither the abuse nor having reported it until she was 17 and regained pieces of her memory. One side of the psychological community believes supposedly recovered memories like these to be real repressed memories. The other side does not believe in the validity of such recovered memories for various reasons (e.g., the experimentally demonstrated susceptibility of our memory to be changed and to be distorted by the implementation of false memories (Loftus & Pickrell, 1995)). For Nicole Kluemper, the uncertainty over the reliability of her memories remains a painful and confusing unsolved part of her identity (Chattopadhyay, 2017).

Repression

Repressed memories are theorized to be related to a process called 'repression,' which was proposed by Sigmund Freud. He advocated and refined the concept of repression as a defense mechanism (Anderson & Green, 2001). However, his definitions of this concept differ. In some publications, he describes it as an automatic and unconscious defense mechanism (Freud, 1957, as cited in Geraerts, 2007), while in others, he describes it to be a habitual, voluntary, and active coping style (Freud, 1959, as cited in Geraerts, 2007). Freud theorized that repression is not a cure for traumatized individuals but rather part of the problem since the memories, though unavailable, elicit pathological symptoms. According to this theory, the goal of psychotherapy should thus be to undo the repression (Otgaar et al.,

2019). Applying this manner of therapy has led to recoveries of childhood abuse memories and serious accusations (Shaw & Vredeveldt, 2019), stimulating the debate mentioned above referred to as the "memory wars" (Loftus & Pickrell, 1995; Pezdek & Roe, 1997).

Increasing our knowledge about the originality and the mechanisms behind these so-called repressed memories would help psychiatrists understand them and use adequate methods when treating affected patients. Another field that would profit could be legal settings, where testimonies are often purely based on memory. Today, judges' understandings of the reliability of these memories still vary, leading to less equal and accurate rulings. Therefore, much more future research is required.

TNT Paradigm and Suppression Induced Forgetting

Within memory research, it is still a highly controversial question whether people can forget specific memories on purpose in the first place (Patihis et al., 2014). Something hypothesized to shed light on this part of the memory dispute is the laboratory paradigm called the Think/No-Think (TNT) task, designed by Anderson and Green (2001). It assesses suppression-induced forgetting (SIF), which refers to forgetting after suppressing the retrieval of the remembered material when faced with multiple reminders. During the task, participants first learn to associate word pairs (hint and response word) so that they can recall the response word upon seeing the hint word. Afterward, they are presented with colored hint words and are either supposed to think of and recall the response word (for green hint words) or actively prevent thinking of the response words at all (for red hint words). It is theorized that SIF has occurred when the recall accuracy for baseline items (items not included in the critical Think/No-Think phase but only in the learning and final recall phase) is better than for no-think items. To assess the participant's memory of the response words, the last phase of the experiment includes two versions of memory assessment (same-probe and independent-probe).

A recent meta-analysis of studies using the TNT paradigm to examine SIF concluded that "forgetting is a hallmark of psychological well-being" (Stramaccia et al., 2021, p. 828). They derived this conclusion from their analysis, suggesting that suppressing memory retrieval is related to less recall of that memory in healthy participants (small to moderate effect size 0.28) than in individuals with psychological disorders characterized by intrusive thoughts (anxious 0.21; depressed 0.05). However, something more striking for the present study is that they also found that participants with a repressive coping style showed even stronger effects of SIF (0.42) than healthy individuals without a repressive coping style. This finding is highly interesting considering that parallel to the debate about the existence of repressed memories, there is another ongoing debate about whether adopting a repressive coping style is advantageous (e.g., Erskine et al., 2016; Pauls, 2007; Hertel & McDaniel, 2010) or rather harmful (e.g., Myers & Derakshan, 2015) for an individual.

Repressive Coping Style

The concept of the repressive coping style (RCS) stems from Freud's theory of repression mentioned above. Today there are many ways to define it, but generally, it entails protecting the self by avoiding focusing on threatening information (Garssen, 2007). Weinberger conceptualized repressive copers to score low on anxiety and high on defensiveness (Weinberger et al., 1979; Weinberger, 1995). He also established four categories of individuals using the same typology. Besides repressive copers, it includes: Truly low anxious individuals (low anxiety; low defensiveness), high anxious individuals (high anxiety; low defensiveness), and defensive high anxious individuals (high anxiety; high defensiveness). An example of a study included in the meta-analysis by Stramaccia et al. is the study by Kim et al. (2007). The researchers investigated differences between individuals with and without a repressive coping style regarding their ability to inhibit unwanted memories. They used the TNT task to measure forgetting through suppression and found that

repressors more successfully suppressed the material they were instructed to suppress. However, the results of their study suggested another interesting thing, namely, that suppression success was mainly related to low trait anxiety scores rather than the combination of low trait anxiety and high desirability.

Evaluating Findings on Repression as a Coping Mechanism

Research has found that repressive copers report lower anxiety levels than their physiological responses indicate (Weinberger, 1995; Derakshan & Eysenck, 1997). Some psychologists assess this negatively in the sense that repressive copers fail to recognize their state of being or downplay their anxiety to seem more socially desirable to others (Weinberger, 1995). One study found that repressive copers scored high on alexithymia, defined as the inability to identify and describe one's emotion, classified as a disorder (Myers & Derakshan, 2015). In addition, studies showed that repressive copers are less able to remember experimentally presented negative material and have less negative autobiographical memories (Myers & Brewin 1994; Myers et al., 1992; Geraerts et al., 2006). Some argue that this might cause difficulties in connecting present experiences with experiences from the past (Davis, 1995), which could lead to problems in adapting because people need to remember negative experiences to learn from them. Some studies even suggest that repressive copers have worse physical health than non-repressors, such as higher percentages of cancer and death from coronary heart disease (Denollet et al., 2008; Jensen, 1987). All these sorts of findings characterize repressive coping as rather defective than favorably.

On the contrary, however, the aforementioned findings suggesting that repressive copers lack negative autobiographical memories could be considered an advantage. Research suggests that forgetting adverse events is related to increased well-being (Charles et al., 2003), while increased elaboration of negative material is related to depression (Mathews &

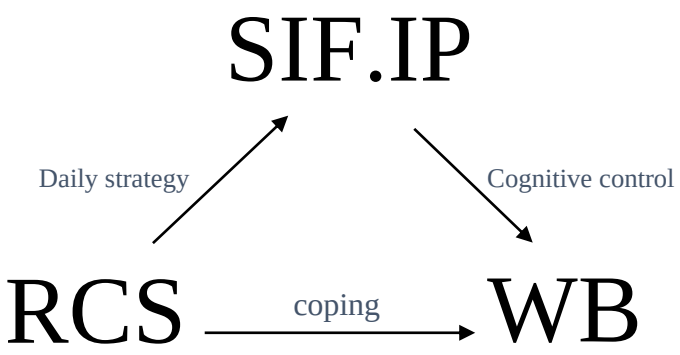
MacLeod, 2005). In addition, researchers suggest that repressive copers use suppression to cope with short term harmful intrusions (Geraerts et al., 2007), which may be a protective factor against mental illnesses, as intrusive processes (e.g., rumination) have been shown to negatively influence the onset and progression of mental disorders (Smith et al., 2018). Suggestive of this, multiple studies show that repressive copers can suppress and prevent stressful and disturbing material from entering consciousness (Stramaccia et al., 2021; Geraerts, 2007), whereas people who suffer from psychological disorders with intrusive cognitions (e.g., anxiety, depression, and PTSD) lack these inhibitory processes (Stramaccia et al., 2021; Brewin, 1998) and thus frequently experience uncontrollable negative thoughts that maintain the disorders. Furthermore, these intrusive cognitions may be related to lower levels of working memory capacity. A study designed to assess the relationship between RCS and working memory capacity suggests that repressive copers have a higher ability to suppress *because* they have an enhanced working memory capacity (Geraerts et al., 2007). In addition, the ability to suppress and inhibit involuntary retrieval may, in general, facilitate efficient cognition (Stramccia et al., 2021). A study conducted to assess the protective influence of repressive coping on stress and trauma assessed people's mental health who lost dear people to suicide. Their findings propose that repressors cope more effectively with the loss and general stress by using more productive, solution-focused strategies and assigning less meaning to negative intrusive thoughts (Parker & McNally, 2008). Similarly, other research findings suggest that repressors should be regarded as well-functioning and that a repressive coping style might promote effective and long-lasting adjustment to trauma and stress (Ginzburg et al., 2002; Kim et al., 2007). These findings could be related to other findings that suggest that repressive copers are generally higher in optimism and self-esteem than nonrepressors (Myers & Reynolds, 2000). Other findings that further speak for the advantageousness of adapting a repressive coping style indicate that many individuals adopt

an RCS later in life. At the same time, some research observed that older people have higher levels of well-being and significant mental health advantages. Older individuals with an RCS demonstrated lower scores on various psychological disorders and greater happiness than non-repressors of similar age (Erskine et al., 2007; Erskine et al., 2016). In addition, it was also suggested that people form a repressive coping style in response to life stressors to cope with the situation (Zachariae et al., 2004). Based on these kinds of findings, experts proposed that suppression training could be applied in therapy to treat mental disorders, especially depression (Joormann et al., 2009).

RCS, SIF, and WB

Combining the suggestions of all these studies, we developed several ideas. Repressive copers might generally be better at controlling their thoughts, which is represented by their high SIF scores. So, individuals with an RCS might achieve higher SIF scores *because* they have heightened thought control, presumably because they practice this skill daily. Moreover, well-being (WB) may be directly attributable to this heightened thought control, particularly the ability to suppress, as this ability protects against distressing cognitive intrusions like rumination and flashbacks and enables functional ways of dealing with stress. Accordingly, it is possible that repressive copers have increased well-being because they have the cognitive control to suppress unwanted and distressing thoughts, which protects them from ruminating about the past or worrying about the future (Model 1 visualizes this relationship).

Model 1. *The relationship between RCS, SIF, and WB*



Note. SIF as the mediating variable between repressive coping and well-being. RCS is related to SIF due to the increased use of cognitive control strategies. This heightened cognitive control prevents distressing thoughts from affecting an individual negatively, increasing well-being.

Aim

Although prior studies found evidence for SIF (Anderson & Hanslmayr, 2014; Anderson & Huddleston, 2012; Kim et al., 2013), others could not replicate these findings (e.g., Bulevich et al., 2006; Mecklinger et al., 2009). In the present study, we aimed to replicate the SIF effect in our student population to investigate the relationship between repressive coping, well-being, and SIF. Both repressive coping and well-being were assessed via self-rating questionnaires.

Hypotheses

We expected to find that participants who displayed higher levels of RCS would also show higher levels of SIF (H1), as suggested by the findings of prior studies (Kim et al., 2007; Hertel & McDaniel, 2010). In addition, we hypothesized that participants who exhibited high scores on RCS would also display higher levels of WB (H2). We also expected that participants who indicated higher levels of SIF would display higher levels of

well-being as well (H3). Finally, we hypothesized that the relationship between RCS and WB could be explained by SIF (H4).

Final Recall Assessment

To investigate SIF, we conducted the TNT experiment. The final phase of this is assessing final recall, of which we included two versions of tasks: the same- and the independent-probe task. The theory behind applying the two different tasks is that different underlying mechanisms may cause forgetting. Memory on same-probe items may be related to the associative strength between the hint and response words, whereas the recall on the independent-probe task may rather be related to the general accessibility of the response word. If the SIF effect did not generalize to the independent probe task, memory loss was likely due to associative interference rather than inhibition. It is suggested that only direct suppression produces both the same- and independent-probe SIF effect. Suppose the participant's memory was lost for no-think items on the same-probe task but not on the independent probe task. In that case, it is assumed that participants did not forget the response word itself but rather only the association between the hint and response word, which the mechanism of interference might explain better than the mechanism of inhibition.

Method

Participants

Among initial participants, a total of 35 (six males, 29 females) undergraduate students from the University of Groningen participated in this study and were recruited through the university participant pool system 'SONA' and compensated with 'SONA credits.' Five participants had to be excluded from this study. Among them was one participant who failed to meet the criterion for the learning phase (timeout) and four who did not complete the questionnaire after the experiment. So, we mainly worked with the complete data of 30 participants (six males, 24 females). Participants were informed and asked for consent before

the TNT experiment and debriefed twice (after the experiment and after the questionnaire study). There were no inclusion criteria for participation. Participants' scores on the TNT task and their questionnaires' results were ranged on continuous scales. The ethics committee of the Faculty of Psychology of the University of Groningen approved this study.

Measures

TNT paradigm

The Department of Clinical Psychology at the University of Amsterdam provided the experimental TNT-Task (all files can be retrieved from osf.io/e75a6). The task includes 54 word pairs from Benoit and Anderson's (2012) set of items. The word pairs are distributed into 12 baseline, 12 no-think, 12 think, and 18 filler pairs. The pairs are divided into three versions to counterbalance baseline, think, and no-think pairs across participants (Inquisit files: 'Distraction-A,' 'Distraction-B,' 'Distraction-C'). The task consists of three main phases (Anderson & Green, 2001) (for a more detailed and step-by-step description of the procedure, see Appendix B).

First, participants were presented with the word pairs and instructed to learn to associate the pair's words so that they could recall the response words (the second word) upon seeing the hint word (the first word). Then, the participants were tested on their memory of the word pairs until they responded to each hint word correctly once.

In the second phase, the critical TNT phase, participants were presented with the hint words again. However, half of the words appeared in green (think) the others in red (no-think) (baseline items were not presented during this task). The participants were instructed to think about and respond to the green hints and actively suppress the memory of the response words for the red hint words. The participants were specifically instructed to directly suppress the response word from coming to mind, however, without using thought substitution or by simply not paying attention to red hint words. The cues were presented 12 times each,

resulting in 144 "no-think" and 144 "think" trials in total, providing multiple opportunities to apply memory suppression.

In the third phase, participants were tested on their memory of all hint words again, including those that were not part of the TNT phase but only presented in the first phase of the experiment (baseline items). The third phase included two tasks, the same- and the independent-probe task. Each participant participated in both tasks, but it varied which task was conducted first to counterbalance. The same-probe task was similar to the memory test in the first phase: Participants were presented with the hint words (presented in white) and instructed to respond with the associated response word. In the independent-probe task, participants were presented with category cues and the first letter of the response words instead of the known hint words (e.g., 'Royalty-Q' as a cue for the response word 'Queen'). They were supposed to think of the response word, which belongs to the presented category, and starts with the presented letter.

During the TNT phase, a diagnostic questionnaire was presented to the participants twice (after the practice round and in the middle of the actual task) to assess participants' comprehension of and adherence to the instructions (Anderson et al., 2004). The questionnaire consisted of 7 items, including questions such as: "When you looked at the RED hint word, how often did you read and understand it?"

Questionnaires

The questionnaire was constructed with Qualtrics and consisted of four scales. It included the Dissociative Experiences Scale (DES), which was not of interest for this present research. The three Questionnaires relevant for this research are the anxiety and the social desirability scales to assess repressive coping as well as the well-being scale. For each scale, we added one item serving as an attention check to detect careless responses. Attention check

items were formulated like: "I am a student," for which the acceptable answer was 'true.' Participants' data would have been excluded if they failed one or more of these control items.

Psychological well-being. The PWB (Ryff, 1989) was administered to identify participants' perceived well-being on a continuous scale. It consists of 18 items, including questions such as: "I judge myself by what I think is important, not by the values of what others think is important." Higher scores indicate higher psychological well-being. The items are measured on a 7-point Likert scale [1 = strongly agree; 2 = somewhat agree; 3 = a little agree; 4 = neither agree or disagree; 5 = a little disagree; 6 = somewhat disagree; 7 = strongly disagree] and the total scores can range between 18 (low well-being) and 126 (high well-being).

Repressive coping. Repressive coping was assessed using a combination of the Marlowe-Crowne Social Desirability Scale (MCSD) and the Taylor Manifest Anxiety Scale (TMAS). To obtain a continuous measure of repressive coping, we used the Index of Self-Regulation of Emotion (ISE). ISE = 20 - (TMAS score – MCSD score) produces high scores for individuals displaying low anxiety and high social desirability (Mendolia, 2002).

The MCSD assesses the tendency to produce socially desirable self-presentations, which is typically used to assess defensiveness to detect repressive copers. The scale comprises 33 questions with dichotomous (True or False) response options. The total scores range between 0 (low defensiveness) and 33 (high defensiveness). The items consist of questions such as: "If I could get into a movie without paying and be sure I was not seen, I would probably do it."

The TMAS measures trait anxiety. We used the short version with 20 items since it has been found that the short version is more practical and clinically valid than the standard version with 50 items (Bendig, 1956). The answer choices are 'True' and 'False,' and higher scores indicate higher anxiety levels. The total score can range between 0 (low anxiety) and

20 (high anxiety). The TMAS includes items such as: "I worry quite a bit over possible misfortune."

Procedure

The study was conducted in English via a google meet session. Every session was conducted with only one participant and one experimenter present. To qualify for the experimenter role, all experimenters took the LexTale test, a brief vocabulary test by Lemhöfer and Broersma (2012). Experimenters had to score above 80% (i.e., C1 & C2 levels based on Lemhöfer & Broersma, 2012). In addition, the experimenters learned the word pairs and independent probes with 100% accuracy and passed a mock trial session.

Before starting the experiment, the experimenter went through the experimental control questionnaire to ensure that all technicalities (internet, camera, microphone) worked and that the participants' environment was appropriate (no distractors). The experimental control questionnaire consists of 11 items, including questions such as: "Has the participant switched off their phone?." The session continued only if all questions could be answered with 'yes.' If not all items of the experimental control questionnaire could be ensured, the session was terminated, and the participant was not compensated. Consent was given via a Qualtrics questionnaire, which was sent to the participant via chat before the experiment started. Participants were told that the experiment's goal was to assess their ability to avoid distractions in an attention task. When consent was given, the experimenter opened the experiment on their computer and shared their screen with the participant. The experimenter coded the participant's responses by clicking a key ('1') for correct or incorrect responses. The experiment took approximately 60-75 minutes, depending on how quickly participants learned the word pairs. During the TNT phase of the experiment, participants could take two small breaks of about a minute. After the experiment, the participants received the debriefing form via chat, which the experimenter read to them and answered possible questions. The

debriefing included the entry code for signing up for the online questionnaire, which the participants were encouraged to fill out. The questionnaire was available via SONA as well. Before the questions were presented to the participants, consent was asked for participation and permission to link their experimental data to the data of the questionnaire. After finishing the questionnaire, which took approximately 20 minutes, the participants were presented with a second debriefing document.

Data Analysis

We used the raw data guidance protocol (enclosed in Appendix B) to make sense of the experimental variables.

Data preparation

We exported the questionnaire data as an SPSS-file from Qualtrics. To import the experimental data from Inquisit to SPSS, we merged the summary files from all participants. Before merging the two data sets, we excluded five cases. Then, we merged the two data sets on SPSS by opening the experimental data and commanding SPSS to add variables and sort them by the key-value (SONA number) to link participants' experimental data with their questionnaire data. Before continuing the analysis, we exchanged the SONA numbers with numbers ranging from zero to 30.

Computing variables

SIF scores. To compute the SIF scores, the scores for memory on the suppression items were subtracted from the memory scores of the baseline items for both the same-probe task (expressions.propCorrect_Phase3baseline - expressions.propCorrect_Phase3suppression) and the independent-probe task (expressions.propCorrect_Phase4baseline - expressions.propCorrect_Phase4suppression). This resulted in two variables for the SIF effect (SIF.SP and SIF.IP).

Perceived Suppression Ability. We also included the third question from the diagnostic questionnaire (PerceivedS.) in our analysis, which asked about the participants' perceived ability to suppress the retrieval of red hint words. The question was: 'When you saw the RED hint word, how often were you able to avoid thinking about the word that went with it?' and participants were given five answer options [0 – Never; 1; 2 – Half of the time; 3; 4 – Always]. This question was asked twice (before and during the TNT phase).

RCS and WB scores. To compute the scores for repressive coping, we first added up all scores for the anxiety scale and all scores for the desirability scale with which we then computed the ISE, which we use as an RCS score. To gain a variable for well-being, we added up all response scores.

Anonymity

For Identification, SONA numbers were processed during the study. After linking the data from the experiment to the questionnaire data, all SONA identification numbers were deleted and replaced by numbers between 1-30. Fully anonymized raw data has been publicized for use on OSF (osf.io/d6x4y).

Exclusion

Data preparation and analysis were performed in SPSS. We excluded participants who did not complete the questionnaire (four participants) or who failed one or more attention check items in the questionnaire (zero participants). We also excluded participants who failed to learn all 54 word pairs after 25 minutes (one participant) or during whose session technical, or distraction issues occurred.

The experimental data with all 34 cases was not immediately disregarded, however. Excluding the four cases, we did not have questionnaire data about, had nothing to do with the experimental data itself, so we still used it to analyze descriptive statistics. However, after

looking at the descriptives, we continued our analysis with only the complete data of 30 cases.

Inspecting the SIF Effect

To test whether SIF was significant, we conducted dependent sample t-tests for the difference between Baseline.SP and Suppression.SP and Baseline.IP and Suppression.IP. We also conducted a t-test for the difference between SIF.SP and SIF.IP.

Hypothesis testing

Our research focused on the relationship between SIF scores, well-being, and repressive coping. We decided not to cluster our sample into groups, as suggested by Weinberger (1995). Instead, we wanted to examine the relationship between repressive coping and SIF on a continuous dimension without any cutoff scores to compute more accurate correlations.

For Hypothesis one to three, we computed Pearson and Spearman's correlations. For this, we examined the outliers and tested the assumptions of normality, homoscedasticity, and linearity. For testing our fourth hypothesis, we used PROCESS macro (Hayes, 2022). We used model 4 for our mediation analysis with WB as Y, SIF as the mediator, and RCS as X.

Results

SIF

The descriptive statistics of the experimental variables (SIF.SP, SIF.IP, and PerceivedS.) are summarized in Table 1. They changed only a little after the exclusion of the four cases. To check for an effect of SIF, we conducted a dependent t-test. The difference between Baseline.SP and Suppression.SP ($t(29) = 0.409$, $p = .685$) as well as the difference between Baseline.IP and Suppression.IP ($t(29) = 0.187$, $p = .853$) was not significant. The difference between SIF.SP and SIF.IP was also not significant ($t(29) = 0.109$, $p = .914$).

WB and RCS

The descriptive results of the questionnaire data for RCS and WB are depicted in Table 1 as well.

Table 1. *Descriptive statistics for Baseline.SP, Suppression.SP, Baseline.IP, Suppression.IP, SIF.SP, SIF.IP, PerceivedS., Repressive coping and Well-being*

Variable	N	M	SD
Baseline.SP	34	.8211	.1423
Suppression.SP	34	.8064	.1855
Baseline.IP	34	.6373	.1492
Suppression.IP	34	.6373	.1845
SIF.SP	34	.0147	.1758
	30	.0139	.1858
SIF.IP	34	0	.2339
	30	.0083	.2440
PerceivedS.	34	2.1765	.9991
	30	2.0667	.9803
Repressive coping	30	24.93	7.32
Well-being	30	95.43	12.45

Note. N = 34 before exclusion, N = 30 after excluding 4 cases from the data.
Baseline.SP/IP = baseline scores for same-/independent-probe task.
Suppression.SP/IP = scores of no-think items in same-/independent-probe task.
SIF.SP = SIF scores for same-probe task.
SIF.IP = SIF scores for independent-probe task.
PerceivedS. = response on question 3 of the diagnostic questionnaire "When you saw the RED hint word, how often were you able to avoid thinking about the word that went with it?" [0 – Never; 1; 2 – Half of the time; 3; 4 – Always].
Repressive coping = ISE score for repressive coping.

Well-being = Self-reported well-being score.

Assumptions

SIF.SP

There were no outliers for SIF.SP. We analyzed residual plots to test the assumption of normality, homoscedasticity, and linearity, which displayed normality for SIF.SP. Skewness also suggested that normality is met (values between -1 and 1). However, according to the Shapiro Wilks test, the assumption of normality for SIF.SP was not met ($W(30) = 0.92$, $p = .03$). Table C1 in the Appendix presents the values of skewness for all variables.

SIF.IP

Box Plots and QQ Plots displayed three outliers for SIF.IP [.58, -.58, -.58]. Figure C1 displays the boxplot with the outliers. For these variables, we compared the 5% Trimmed Means (TM) to the normal means to check for the influentiality of these outliers, which revealed no big difference [M = .01, TM = .02]. Because of this, the outliers were not excluded from the data. All values for the trimmed means are listed in Table C1. We analyzed residual plots to test the Assumption of normality, homoscedasticity, and linearity, which displayed normality for SIF.IP. An analysis of the skewness also suggested that normality is met (all values between -1 and 1, see Table C1). However, according to the Shapiro Wilks test, the assumption of normality for SIF.IP was not met ($W(30) = 0.9$, $p = .01$).

WB

There were no outliers for our dependent variable, WB. To test the Assumption of normality, homoscedasticity, and linearity, we analyzed residual plots, which displayed normality for WB. An analysis of the skewness (all values between -1 and 1, see Table C1) and the Shapiro Wilks test also suggested that normality was met ($W(30) = 0.975$, $p = .674$).

Residual plots for WB with SIF.SP displayed homoscedasticity and linearity while these assumptions were slightly violated for WB with SIF.IP and RCS. Scatterplots indicated that the linearity assumption was only met for WB and Repression. Tables C3-C8 show these residual P-P and Scatterplots.

RCS

There were no outliers for RCS. To test the Assumption of normality, homoscedasticity, and linearity, we analyzed residual plots, which displayed normality for RCS. An analysis of the skewness (all values between -1 and 1, see Table C1) and the Shapiro Wilks test also suggested that normality is met ($W(30) = 0.970$, $p = .527$).

PerceivedS.

Box Plots and QQ Plots displayed three outliers [0,0,0]. Figure C2 displays the boxplot with the outliers. To check for the influentiality of these outliers, the 5% Trimmed Means (TM) for these variables were compared to the normal means, which revealed no big difference [M = 2.07, TM = 2.09]. Because of this, we did not exclude the outliers from the data. All values for the trimmed means are listed in Table C1. We analyzed residual plots to test the Assumption of normality, homoscedasticity, and linearity, which displayed normality. An analysis of the skewness (all values between -1 and 1, see Table C1) also suggested that normality was met. However, the Shapiro Wilks test ($W(30) = 0.867$, $p = .001$) did not suggest normality to be met.

Correlation

We calculated the Pearson correlation coefficient and Spearman's rho to test our correlational hypotheses. The Pearson correlation coefficients are reported in Table 4, and Spearman's rank correlation coefficients are reported in Table 5. To determine statistical significance, we used an alpha level of .05. For both SIF.SP and SIF.IP the relationship with RCS was nonsignificant with both Pearson and Spearman's correlation (H1). Pearson

correlation and Spearman's rho were both significant for the relationship between RCS and WB (H2). The relationship between SIF and WB was not found to be significant for neither SIF.SP nor SIF.IP with both correlation tests (H3). Spearman's but not Pearson's correlation displayed a significant correlation between the variables PerceivedS. and SIF.IP.

Table 4. *Pearson correlation between SIF.SP, SIF.IP, RCS, WB, and PerceivedS.*

		SIF.SP	SIF.IP	RCS	WB	PerceivedS.
SIF.SP	r	1				
	sig.	-				
SIF.IP	r	.177	1			
	sig.	.35	-			
RCS	r	-.031	-.235	1		
	sig.	.871	.212	-		
WB	r	-.033	-.262	.779*	1	
	sig.	.865	.161	< 0.001	-	
PerceivedS.	r	.137	.286	.227	.266	1
	sig.	.471	.126	.228	.155	-

Note: * $p < 0.001$.

RCS = repressive coping (style).

WB = well-being.

Table 5. *Spearman's rho correlation between SIF.SP, SIF.IP, RCS, WB, and PerceivedS.*

		SIF.SP	SIF.IP	RCS	WB	PerceivedS.
SIF.SP	ρ	1				
	sig.	-				

SIF.IP	ρ	.081	1			
	sig.	.670	-			
RCS	ρ	.039	-.193	1		
	sig.	.837	.306	-		
WB	ρ	.095	-.289	.751**	1	
	sig.	.617	.121	<0.001	-	
PerceivedS.	ρ	.055	.410*	.170	.223	1
	sig.	.771	.024	.370	.236	-

Note: ** Correlation is significant at the 0.00001 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

RCS = repressive coping (style).

WB = well-being.

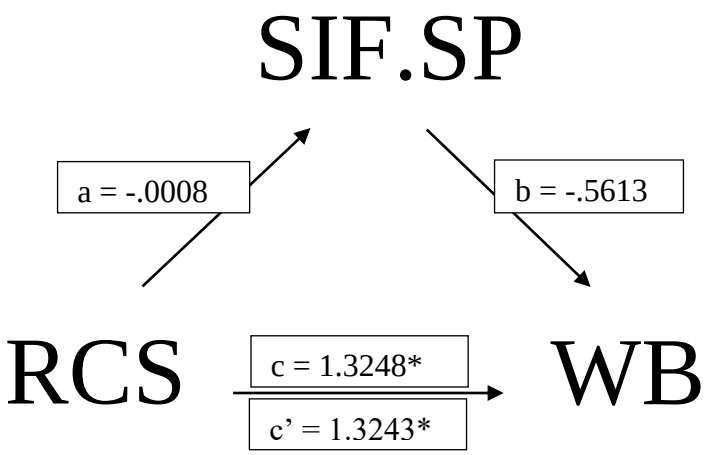
Mediation

With our fourth hypothesis, we expected to find that the relationship between RCS and WB can be explained by SIF (H4). To analyze this, we conducted two mediation analyses with SIF.SP (Output C1) and SIF.IP (Output C2) as mediators, RCS for X, and WB for Y. The Mediation analysis displayed a significant regression of RCS on WB when ignoring the SIF (b = 1.32, p <.001). However, it did not show significance for the relationship between RCS and SIF.SP (b = 0, p = .9) and RCS and SIF.IP (b = -0.01, p =.3048). It also did not show a significant relationship between SIF.SP and WB in the presence of RCS (b = -0.56, p = .97) or SIF.IP and WB in the presence of RCS (b = -4.3, p = .58). Lastly, our analysis showed a significant relationship between RCS and WB in the presence of SIF.SP (b = 1.32, p <.001) and SIF.IP (b = 1.29, p <.001). So, the mediation analysis revealed that RCS was a significant predictor for WB but neither SIF.SP nor SIF.IP

mediated this relationship. The mediation analysis results are depicted in Figure 1 for the mediation with SIF.SP as mediator and Figure 2 for the mediation with SIF.IP as mediator.

Figure 1

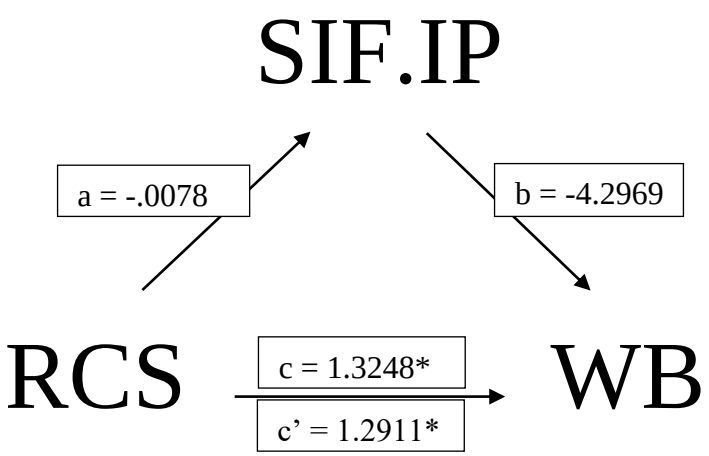
Simple mediation diagram with SIF.SP as the mediator, RCS for X, and WB for Y



Note. The c path coefficient represents the total effect of repressive coping on self-reported well-being. The c-prime path coefficient refers to the direct effect of repressive coping on the self-reported well-being. Both c paths were significant, *p < 0.01. This diagram demonstrates that the conditions for a mediation were not satisfied. Although, RCS was a significant predictor for Y, it was not a significant predictor for SIF.SP. In addition, SIF.SP did not have a significant influence on WB, and the relationship between RCS and WB was still significant when the SIF.SP was included in the analysis.

Figure 2

Simple mediation diagram with SIF.IP as the mediator, RCS for X, and WB for Y



Note. The c path coefficient represents the total effect of repressive coping on self-reported well-being. The c-prime path coefficient refers to the direct effect of repressive coping on the self-reported well-being. Both c paths were significant, *$p < 0.01$. This diagram demonstrates that the conditions for a mediation were not satisfied. RCS was significant predictor for WB however, the relationship between RCS and WB was still significant when the SIF was included in the analysis. In addition, RCS was not a significant predictor for SIF and SIF did not have a significant influence on WB.

Discussion

The main objective of this study was to contribute to our understanding of repressive coping by examining differences in levels of well-being and SIF between individuals who exhibit varying degrees of RCS. Contrary to our first hypothesis, we did not find a positive relationship between repressive coping and SIF (H1). We also did not find a relationship between SIF and well-being (H3). In line with our second hypothesis, we did find a positive relationship between repressive coping and well-being (H2). However, our fourth hypothesis could yet again not be supported since our results did not show that SIF mediates the relationship between repressive coping and well-being (H4).

SIF

In addition to our aim of investigating SIF scores in relation to repressive coping and well-being, part of our objective was also to replicate TNT research and produce SIF in the first place. However, the differences between the recall of baseline items and suppression items were not significant, suggesting that our study could not replicate the findings of a suppression-induced forgetting effect. The difference between SIF on the same-probe task and SIF on the independent-probe task was also not significant. Had we found a significant effect of SIF, this result could have indicated that suppression affected both the strength of the association between the words and the accessibility of the response word, which could

have been considered an indication of the effect being due to inhibition and not simply to associative interference.

Repressive coping and SIF

Our study's results did not indicate there to be a positive relationship between repressive coping and SIF. Other studies also did not find a relationship between repressive coping and suppression (e.g., Myers, Vetere & Derakshan, 2004), however, we based our expectations on studies suggesting these phenomena to be related. We expected repressive copers to be better at suppressing the retrieval of unwanted information due to previous research which suggests that individuals with a repressive coping style use suppression to minimize the effect of negative information on their self-concept (Geraerts et al., 2007) frequently. In addition, multiple studies have reported that their samples of repressive copers recalled significantly fewer memories of harmful material (Myers & Brewin 1994; Myers et al., 1992; Geraerts et al., 2006) than samples of non-repressors. We assumed this to be caused by the effective suppression of these memories. Furthermore, previous studies also using the TNT task to determine the effect of SIF have found higher scores for samples of repressive copers in comparison with other samples (Stramaccia et al., 2021, Kim et al., 2007).

Besides multiple limiting factors related to the execution of our TNT task, which we will elaborate on later, it is possible that participants with higher levels of repressive coping did not show higher levels of SIF because they did not make use of their ability to suppress during our TNT task. Previous findings have suggested that repressive copers avoid and have reduced memory of negative information (Davis, 1987; Davis & Schwartz, 1987; Myers & Brewin, 1994). However, their memory for positive information has been suggested to be equal or even increased (e.g., Holtgraves & Hall, 1995). A study conducted by Kim et al. (2007) specifically found a significant difference between repressors and nonrepressors in SIF (repressors scoring more successful in SIF) for negative stimuli; however, no difference

for neutral stimuli (Kim et al., 2007). This could mean that our participants scoring high on repressive coping were not motivated to suppress properly since the 108 words we used in the present study were generally neutral. Three words that could be considered negative are 'accident,' 'cancer,' and 'rifle.' However, these few exceptions make it hard to examine a significant difference in SIF for positive and negative words. Furthermore, it is hard to control for possible individual differences in perception of the words' meanings. Words like 'Needle,' 'Clown,' and 'Ghost' might be considered neutral by some participants but negative by others. This complicates the examination of SIF for differently charged stimuli additionally.

Repressive coping and Well-being

We expected to find that repressive copers score higher on well-being with our second hypothesis. We came up with this expectation following research that suggested functional consequences of adapting a repressive coping style on well-being (e.g., the ability to inhibit stressful intrusions (Stramaccia et al., 2021; Geraerts, 2007) and the relationship between forgetting negative memories and increased well-being (Charles et al., 2003)). Our results supported this hypothesis, suggesting there might be a positive relationship between repressive coping and well-being. However, one must consider that we measured well-being through a self-report questionnaire. There are other studies also measuring well-being in repressive copers using self-report measures, which for example, also showed that repressors report less neuroticism and sadness and higher self-esteem and optimism (Pauls, 1998). However, it could be possible that participants scoring high on repressive coping may give inaccurate responses on the well-being scale. Prior research has introduced the idea that self-reports of well-being might be unsuitable for repressive copers. This is explained by their measured defensiveness, which may refrain them from indicating low levels of well-being since they avoid negative information about themselves (Myers, 2000; Myers, 2010). It is fair

to assume that repressive copers tend to respond in a self-serving way to avoid negativity and that this falsifies the assessment of well-being.

SIF and Well-being

The fact that our study could not confirm our third hypothesis was most unexpected. We confidently expected that the ability to suppress information effectively is related to well-being. We assumed participants' SIF scores to represent their level of cognitive control. At the same time, we assumed that higher cognitive control is related to more effective coping mechanisms that enable the inhibition of intrusive cognitions and lead to, e.g., less rumination, which is thought to promote well-being (Smith et al., 2018). Therefore, we expected SIF to be the causing factor for the positive relationship between RCS and WB. In contrast, finding disconfirming results may support the previously suggested uncertainty about the reliability of repressors' self-reported well-being scores a fortiori. It now seems even more sensible that the actual mechanism causing these increased scores in well-being could be due to inaccurate responses. However, this would not explain why SIF scores, so cognitive control, are not related to well-being. Later, we will elaborate on our study's experimental limitations, which might best explain why we could not find this relationship in our study.

Mediation by SIF

Not finding a significant mediation effect of SIF between repressive coping and well-being was not surprising considering our previous null results. Instead of confirming our fourth hypothesis, our results might support the idea that repressive copers use other strategies than voluntary suppression to cope with negative information. For example, previous research has indicated that repressive copers have an attentional bias away from negative stimuli *(*Newman & McKinney, 2002). This might mean that they do not, in fact, suppress information but rather ignore it, while the TNT task explicitly demands them to pay

attention to the suppression items. Nevertheless, this tendency to ignore specific information might also be related to heightened cognitive control. This control, however, is not measurable with the TNT task. So, SIF may not be the effect behind repressors' coping style and the TNT task may not be an appropriate tool to assess the difference in cognitive control between repressors and nonrepressors.

Another possible explanation might be that repression is a somewhat unconscious mechanism over which repressive copers have no control. This way, they would not be expected to score higher on SIF since the TNT task requires them to suppress information actively and consciously. As mentioned in our introduction, the theory of repression still, to this day, did not establish whether it is an unconscious or conscious mechanism since Freud released inconsistent definitions (Freud, 1957 vs. Freud, 1959). So, our findings may support the theory that repression, and possibly, repressive coping as well, are rather unconscious processes.

Despite our findings, prior research provided supporting results that repressive coping is related to a higher ability to suppress (Stramaccia et al., 2021). This relationship has even been suggested to be caused by repressors having enhanced working memory capacity (Geraerts et al., 2007), which can be expected to relate to increased adjustment in daily life and increased well-being.

Limitations and Future Considerations

The present study's results should be interpreted with caution due to several potential limitations to this study. Nevertheless, both our findings and limitations raise relevant questions for further research on repressive coping and the use of the TNT paradigm.

Conducting the Experiment Online

Firstly, in hindsight, something that needs to be considered a possible complication is that we conducted our TNT experiment online due to the current Covid-19 measures at our

university. This made it difficult to control for adequate environments without any distractions for our participants. At the beginning of the session, we ensured that the participants were alone in a room with a stable internet connection and a working microphone and camera. However, we could not properly prevent roommates from walking in or being noisy or the internet connection from getting stuck once the experiment had started (which happened at least once every session). When this occurred, it possibly distracted the participant or led to mistakes in coding, causing less accurate results. For this reason, future research should not conduct the TNT experiment via online sessions. The scores on the tasks depend on timing and concentration, which can become an issue with varying internet connections and possible distractors in the participants' private environments. Optimally, each participant should participate under the same environmental conditions to gain reliable results and to make valid conclusions about differences between participants on the tasks that are not caused by confounding variables.

Self-perceived Suppression Ability

Furthermore, we included participants' self-perceived ability to suppress (assessed by question three of the diagnostic questionnaire) in our analysis. We thought it might add valuable insight into the relationship between repressive coping and perceived ability to suppress as well as the relationship between perceived ability to suppress and actual SIF scores. In addition, it gave an idea about our participants' general ability to suppress irrespective of any individual characteristics. Our data showed that our participants generally found it hard to suppress the response words from coming to mind for suppression items. The mean answer of 2 indicates that participants were, on average, only able to not think of the response word half of the time. Spearman's correlation barely found a significant correlation between SIF.IP and self-perceived suppression ability, however, according to Pearson correlation there was no significant correlation at all. This might suggest that participants did

not give accurate responses to this question but instead responded in a socially desirable way. We did encourage them to respond honestly; however, conducting the questionnaire twice might have pressured them to indicate better scores the second time to please us, particularly because we were reminding them of the task each time they did not answer according to the instructions.

Language Barriers

A further limitation might have been the fact that our student population was international, and most of the participant's mother language was other than English, while the stimuli set of the experiment was presented in English. The 108 words from the stimuli set by Benoit and Anderson (2012) included a few words (e.g., 'Cradle,' 'Antler,' 'Adhesive,' 'Helm,' 'Torch,' and 'Vault'), which we noticed were often not known to our participants. We noticed that for these words, it took them very long to form an association in the learning phase, and some participants even expressed that they did not know the meaning of these words during or after the experiment. Before conducting our study, we already anticipated that many of our participants would not be native English speakers. For this reason, we considered the possibility of using the Lextale test by Lemhöfer and Broersma (2012) to assess the English proficiency of our participants beforehand. However, we doubted that it would have ensured that our participants knew the meaning of all the words we used in the task. Not knowing the meaning of a word naturally makes it harder to form a connection between words. So, it is likely that for some word pairs, less strong associations were formed from the start, which possibly led to less accurate data for SIF. For this reason, future research should consider the influence of language on this task since it seems to make a big difference whether participants are familiar with the meaning of a word in forming a connection between the word pairs. We doubt that a general English proficiency test would ensure the knowledge of

all word pairs, so we suggest either using participants who speak the language natively or providing translations or descriptions of the word pairs in the learning phase.

Associative Strength between Words

A further possible limitation is that it was also notable that some word pairs were easier remembered than others due to the general strength of the relatedness between them. This was observable by the experimenters because these word pairs were remembered quickest. In addition, when more intricate word pairs were presented, participants often showed signs of confusion. For example, 'College-Certificate,' 'Vitamin-Lemon,' and 'Waffle-Maple' were more easily remembered than, for example, 'Hug-Rose,' 'Jogger-Collie,' and 'Journey-Trousers.' This was also very notable for the independent probe task. Some category words described the response words better than other category words. For example, 'Extinct-D' for 'Dinosaur' seemed to be more evident to participants (probably because dinosaurs are the most familiar extinct species) than, for example, 'Decoration-P' for 'Picture' (since there could be a lot of other decorations starting with P (e.g., painting, pillows, plants)). Supporting this observation was the fact that multiple participants remembered 'Picture' as a response to 'Nail' but expressed confusion when presented with the cue 'Decoration-P.' To give another example, 'Royalty-Q' seemed to be a stronger cue for 'Queen' than 'Dogs-C' for 'Collie.' This is possibly the case because multiple dog breeds start with C (e.g., chihuahua, corgi, cocker spaniel), but 'Queen' is the only word related to royalty, starting with a Q.

One may argue that the condition of continuing the experiment only when all response words are correctly recalled once (i.e., 100% criterion) is enough to ensure that the participants were equally able to form associations for all word pairs. However, this criterion cannot make up for the possibility that some word pairs are consolidated more robustly and permanently and that this weakens the reliable assessment of SIF. Moreover, the drop-off procedure of the experiment enables the 100% criterion by taking the correctly recalled word

pairs off the list of yet-to-be-learned pairs. This ensures that recalled words are not strengthened more often than other word pairs. However, towards the end of the phase, only a few pairs are left and therefore presented very closely spaced (it often even occurred that a hint word is presented twice (or three times) in a row). We dare to argue that these (two or three last) word pairs are not remembered because a proper association between the words has been established but because the participant simply remembered it still from seeing it seconds ago (and that the memory for these word pairs is less permanent).

These observed differences should be considered for future research to improve the assessment of SIF. The formation and deformation of the connection between the words must be similar in feasibility to secure valid results of SIF. These limitations of the way we conducted our TNT experiment (conducting it online, the language barriers, and the stimuli set) may explain why the SIF scores were not correlated to participants' self-perceived ability to suppress. This further might have led to our results being contraindicative of our hypotheses predicated on individual's SIF scores (H1, H3, and H4).

Furthermore, as discussed about the relationship between repressive coping and SIF, the neutrality of the words should be considered in the future. To accurately determine an exclusive effect for SIF, one should use words with a similar emotional charge. However, for examining the SIF effect in repressive copers, it could be interesting to include uncontroversial positive and negative words since there might be a difference in SIF for these different words between repressive copers and control groups.

Lastly, as discussed about the relationship between repressive coping and well-being, it has been suggested that repressive copers might feign inaccurate high scores on well-being on self-report measures since they are high in defensiveness by our currently applied definition. Therefore, it would be crucial to use indicators of well-being that are not vulnerable to inaccurate responses, especially when working with repressive copers. Myers

(2015) already introduced possible measures that could obviate obtaining inaccurate indices of well-being by repressors. For example, she suggested that instead of relying on self-reports, independent raters should examine repressors' responses (Myers, 2015). Another possibility may be using the opinions of well-informed others to validate participants' responses. Unfortunately, our lack of resources did not allow us to implement these suggestions in the present study; however, implementing this in future research would add more certainty to the findings.

Conclusion

To conclude, the present study's results suggest that there is a positive relationship between repressive coping and self-reported well-being. However, the reliability of self-indicated well-being by repressive copers should be further investigated to safely suggest that repressive coping may be an advantageous mechanism to live a happy life. Furthermore, our study could neither replicate prior research findings that indicated an effect of suppression-induced forgetting nor findings that suggest that repressive copers possess an increased ability to effectively suppress information on purpose. Due to the, in hindsight, plurality of limitations, the results of our study should be interpreted with caution. Future research should investigate the three-way relationship between repressive coping, well-being, and SIF further; however, researchers should consider our limitations beforehand. Especially the modification of the stimuli set by Benoit and Anderson (2012) would be essential to assure more reliable results of the TNT task.

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Appendix A

Step-by-step procedure of the TNT paradigm

Step 0: Preparation	Before the participant joins the session, the experimenter prepares the logbook - Experimenter ID - Participant ID - Condition (A, B, or C) - Date - Time
Step 1: Greeting, Consent, Experimental Control Questionnaire, and Distraction Check	The experimenter greets the participant and sends them the consent form (to be filled out before the experiment). The experimenter will then start with the control questionnaire to assess whether the technical setup is working and the environmental adequate to ensure participation without distractions. The experimenter also goes through the distraction check to assess whether the participant is suitable for the study. Experimental Control Questionnaire: 1. Was the participant able to join the session? 2. Is the camera working and showing the participant's head? 3. Is the participant's microphone working? 4. Can the participant hear you? 5. Is the internet connection stable? 6. Has the participant switched off their phone? 7. If applicable, has the participant switched off their second screen? 8. Has the participant closed all other desktop applications?

	Distraction Check: 1. Is it noisy in the background of the participant? If yes, and if you cannot solve this problem the session ends here. 2. Is it busy in the background of the participant? If yes, and if you cannot solve this problem, the session ends here. 3. Does the participant seem distracted? If yes, and if you cannot solve this problem and the participants seems still distracted/uninterested, the session ends here. If not all conditions are fulfilled, the experiment will be terminated here and the participant will not be compensated. If the participant passes these checks, they will be compensated regardless of the further course of the session.
Step 2: Introduction of the task	Experimenter turns off their camera and reads the introduction presented on screen. It is important to avoid the word 'Memory' so participants do not expect a memory test in the end (otherwise they might try to remember all words).
Step 3: Learning phase	Experimenter reads instructions for the learning phase and turns off their microphone afterwards to not distract the participant during the phase. The 54 hint-response word pairs appear each once and individually on the screen for five seconds. The participant is instructed to form a connection between the two words so that when he will be presented with the first (hint) word he is able to recall the second (respond word).
Step 4: Test feedback phase	The Experimenter reads the instructions and afterwards turns

	off their microphone again. To test the participant's knowledge of the word pairs they are presented with only the hint words on the screen for five seconds and instructed to say the appropriate response words out loud as fast as possible. The experimenter will code the answers given with key '1' for correct answers and not pressing any key for incorrect or no answers. If the participant does not recall the correct response word it will appear on screen in blue for 2.5 seconds and will be asked again. The participant must correctly respond to each hint word once. If the participant is not able to recall all response words after 25 minutes (timeout) the experiment is terminated.
Step 5: TNT practice phase	The experimenter gives instructions for the TNT task and mutes himself afterwards again. The participant is instructed to recall and say out loud the response words for hint words that are presented (for 3.5 seconds) in green, while they should not think off and not say the response words out loud for hint words that are presented in red. The participant receives direct instructions to try to block the response for red hints from coming to mind while still paying attention to each red hint word, and not by thinking of something else than the red hint. The experimenter codes the responses by pressing '1' for green hint words if the response given was correct or for red hint words when any response was given. If the participant does not recall the response word for a green hint word it will appear in blue (for two seconds) to remind them of the correct response. If the participant gives a response to a red hint word an error message will be presented to remind them of the task.

	The practice phase includes 48 trials with 12 filler pairs, in which six red and six green hints will be presented four times each.
Step 6: Diagnostic Questionnaire	The diagnostic questionnaire will be presented to ensure that participant understands and follows the instructions properly. The Experimenter and the participant go through the seven questions together and the experimenter will fill in the responses given by the participant. 1. For the green hint words, how often did you try to come up with the associated response as FAST as possible? [0 – Never; 1; 4 – Always] 2. When you looked at the RED hint word, how often did you read and understand it? [0 – Never; 1; 4 – Always] 3. When you saw the RED hint word, how often were you able to avoid thinking about the word that went with it? [0 – Never; 1; 4 – Always] 4. When you saw the RED hint word, how often did you think of the word that went with it and simply didn't say it out loud? [Reversed: 4 – Never; 0 – Always] 5. When the RED hint word went off the screen, how often, did you then think about the word that went with it? [Reversed: 4 – Never; 0 – Always] 6. When you saw the RED word, did you ever think about the associated word "for just a second" to see if you still knew it? [Reversed: 4 – Never; 0 – Always] 7. Typically, for how many seconds did you look at a RED hint word when it was presented on the screen?[0; 1; 2; 3; 4] The experimenter repeats the appropriate instructions if participants score below 3 for normal items, above 1 for

	reversed items or an answer below 4 for question 7.
Step 7: TNT phase	The experimenter quickly repeats instructions and mutes themselves to start the actual TNT task. This phase includes 12 red and 12 green hint words, which are presented in the middle of the screen in a random order. Each cue is presented 12 times.
Step 7.2: BREAK	60 second break then continue TNT task
Step 7.3: Diagnostic questionnaire	The same questions will be asked again, and the experimenter reminds the participant of the instructions if the participant answers not according to the instructions. Afterwards the TNT task continues.
Step 7.4: BREAK	60 second break then continue TNT task
Step 8 and 9: Randomized order: SP or IP task (with practice)	The experimenter reads the instructions for the same-probe task and independent-probe task. Same probe: In this phase the participant is presented with the hint words for four seconds again. All hint words are presented in white. Some hint words were included in the TNT phase, but some were also not shown since the test-feedback phase (baseline items). The participant is instructed to say all appropriate response words out loud as quick as possible. The experimenter codes the responses by only pressing ‘1’ if the participant recalls the correct response word in time. Independent probe: In this phase, the participant is presented with category words that describe the response word and the first letter of the response word. The participant is instructed to

	come up with the associated response word and say it out loud as quickly as possible. The experimenter codes the responses by only pressing '1' if the participant recalls the correct response word in time. Both phases start with a practice phase to ensure that the participant understood the instructions. Both the SP and the IP start with eight filler items, followed by 36 critical items presented in random order.
Step 10: Debriefing	The participant receives the debriefing form, and the experimenter reads it out loud and answers possible questions.
Step 11: Logbook and compensation	After the participant has left the session, the experimenter fills in the empty field of the logbook: - which condition was first presented SP or IP? - Could the session be started? - Post-hoc exclusion? - Notes if applicable

Appendix B

Raw Data Guidance Protocol

Inquisit-Part (Think/No-Think Task)

subject: Anonymous Subject ID
inquisit.build: Version property of Inquisit
computer.platform: computer that was used to collect data (win = Windows)
script.startdate: Date when data was collected in string format (51021 = 5th of May 2021)
script.starttime: Start-Time when data was collected
script.groupid: the group participants were in (we only have one group built into Inquisit; counterbalanced word condition are separate Inquisit scripts)
script.elapsedtime: Elapsed time during the TNT task in ms (excluding the Qualtrics at the end of the session)
expressions.propCorrect_Phase2: Accurate overall response in TNT phase (in %; 0-1)
expressions.propCorrect_Phase2suppression: Accurate response in suppression trials of TNT phase (in %; 0-1)
expressions.propCorrect_Phase2recall: Accurate response in recall trials of TNT phase (in %; 0-1)
expressions.propCorrect_Phase3: Accurate overall response in same-probe test (in %; 0-1)
expressions.propCorrect_Phase3suppression: Accurate response in suppression items of same-probe test (in %; 0-1)
expressions.propCorrect_Phase3recall: Accurate response in recall items of same-probe test (in %; 0-1)
expressions.propCorrect_Phase3baseline: Accurate response in baseline items of same-probe test (in %; 0-1)
expressions.propCorrect_Phase3filler: Accurate response in filler items of same-probe test (in %; 0-1)
expressions.propCorrect_Phase4: Accurate overall response in independent-probe test (in %; 0-1)
expressions.propCorrect_Phase4suppression: Accurate response in suppression items of independent-probe test (in %; 0-1)
expressions.propCorrect_Phase4recall: Accurate response in recall items of independent-probe test (in %; 0-1)
expressions.propCorrect_Phase4baseline: Accurate response in baseline items of independent-probe test (in %; 0-1)
expressions.propCorrect_Phase4filler: Accurate response in filler items of independent-probe test (in %; 0-1)
values.countPhaseIrecall: Trials the participant needed to learn all word pairs until 100% accuracy
values.countPhaseIstudy: variable to check whether all worked well; all participants should be given 54 word pairs to learn
values.ncorrect: variable to check whether all worked well; all participants should have learned 54 word pairs accurately
values.countPhaseII: variable to check whether all worked well; all participants should be given 292 trials (291 excluding the last break that was omitted after pilot) in the TNT phase (288 TNT trials + 3 breaks + Diagnostic Questionnaire)
values.countPhaseIII: variable to check whether all worked well; all participants should be given 36 cues in the same-probe test

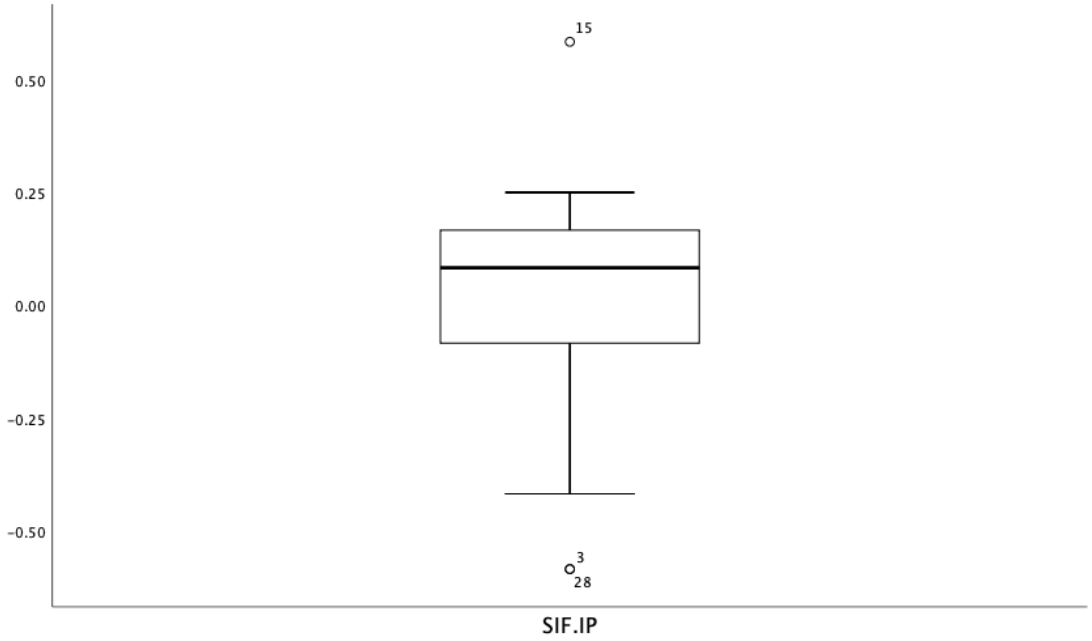
values.countPhaseIIII: variable to check whether all worked well; all participants should be given 36 category items in the independent-probe test
[not in pilot data yet, but now integrated into the Inquisit script:
expressions.baseline3latency: average time of responding for baseline items in the same-probe test in ms
expressions.recall3latency: average time of responding for recall items in the same-probe test in ms
expressions.suppression3latency: average time of responding for suppression items in the same-probe test in ms
expressions.baseline4latency: average time of responding for baseline items in the independent-probe test in ms
expressions.recall4latency: average time of responding for recall items in the independent-probe test in ms
expressions.suppression4latency: average time of responding for suppression items in the independent-probe test in ms]
Counterbalancing: which word pair group the participant was in (A, B, C)
FirstAnalysis: which test appeared first (1 = same-probe first, 2 = independent-probe first)

Inquisit Part (First Diagnostic Questionnaire Items)

date: same as **script.startdate**
time: same as **script.starttime**
group: same as **script.groupid**
build: same as **inquisit.build**
DiagQuest_diag1_response: Diagnostic Questionnaire item 1 (response options: 0-4)
DiagQuest_diag1_latency: time it took to give a response in ms
DiagQuest_diag2_response: Diagnostic Questionnaire item 2 (response options: 0-4)
DiagQuest_diag2_latency: time it took to give a response in ms
DiagQuest_diag3_response: Diagnostic Questionnaire item 3 (response options: 0-4)
DiagQuest_diag3_latency: time it took to give a response in ms
DiagQuest_diag4_response: Diagnostic Questionnaire item 4 (response options: 0-4)
DiagQuest_diag4_latency: time it took to give a response in ms
DiagQuest_diag5_response: Diagnostic Questionnaire item 5 (response options: 0-4)
DiagQuest_diag5_latency: time it took to give a response in ms
DiagQuest_diag6_response: Diagnostic Questionnaire item 6 (response options: 0-4)
DiagQuest_diag6_latency: time it took to give a response in ms
DiagQuest_diag7_response: Diagnostic Questionnaire item 7 (response options: 0-4)
DiagQuest_diag7_latency: time it took to give a response in ms

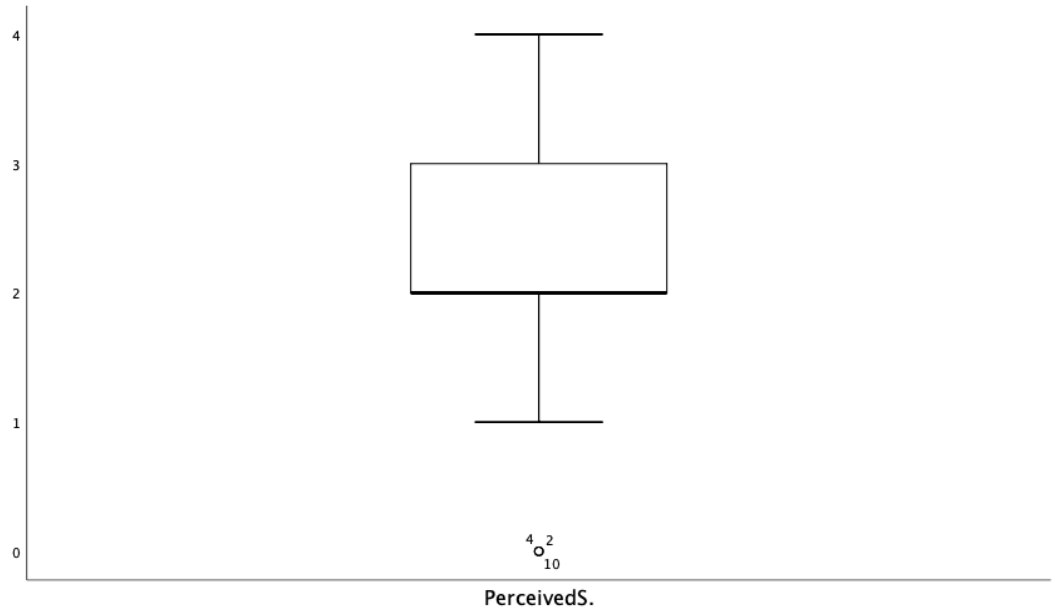
Appendix C

Figure C1. *Boxplot with outliers for SIF.IP*



Note. Two outliers at -.58 and one outlier at .58.

Figure C2. *Boxplot with outliers for PerceivedS.*



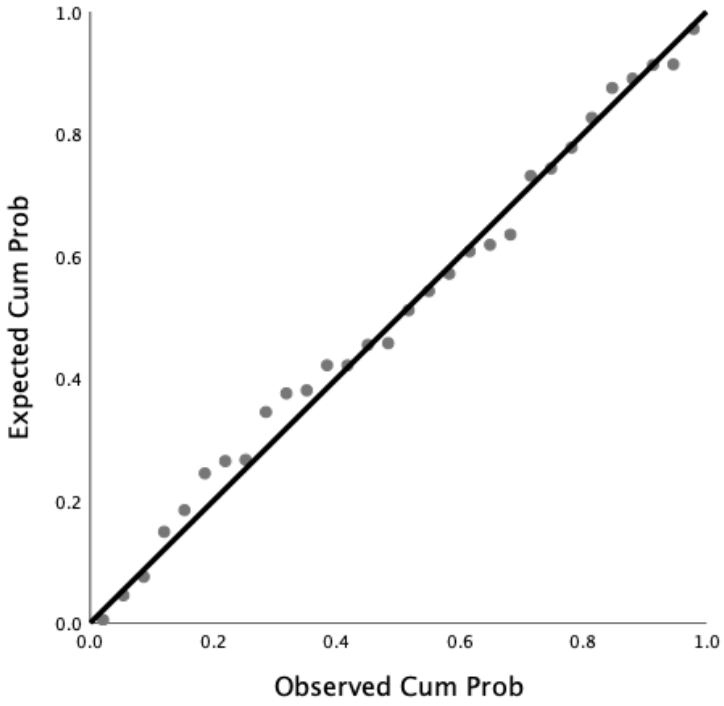
Note. Three outliers for the response of zero.

Table C1. *Assumption testing: Skewness, 5% trimmed mean*

	Skewness	Mean	5% trimmed mean
SIF.SP	.996	.014	.002
SIF.IP	-.732	.008	.015
WB	-.257	95.433	95.722
RCS	-.248	24.933	25.093
PerceivedS.	-.611	2.067	2.093

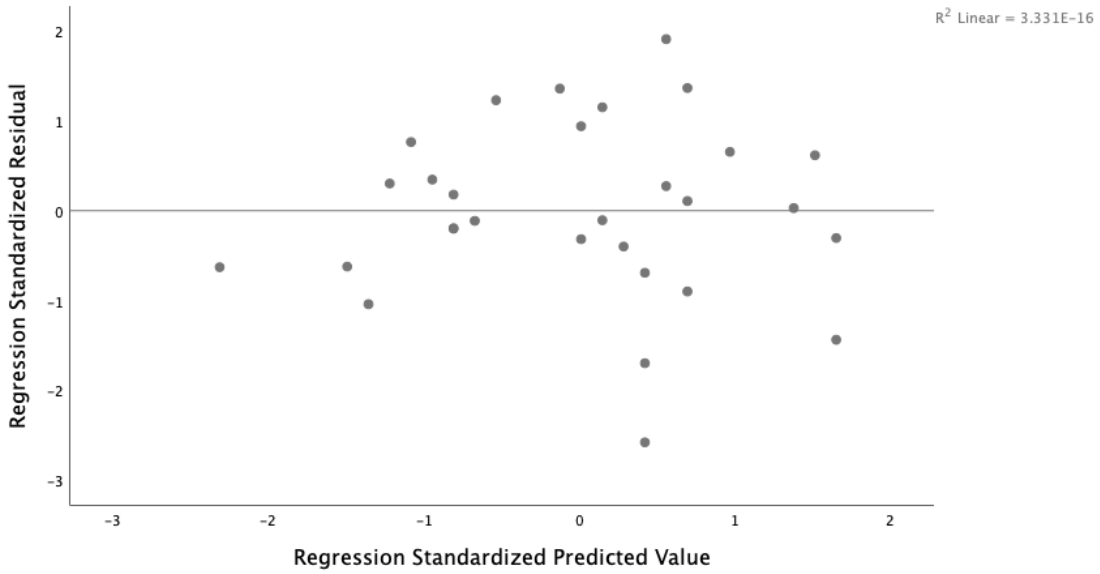
Note. Skewness never above 1 or below -1.

Figure C3. *Residual P-P Plot for WB and RCS*



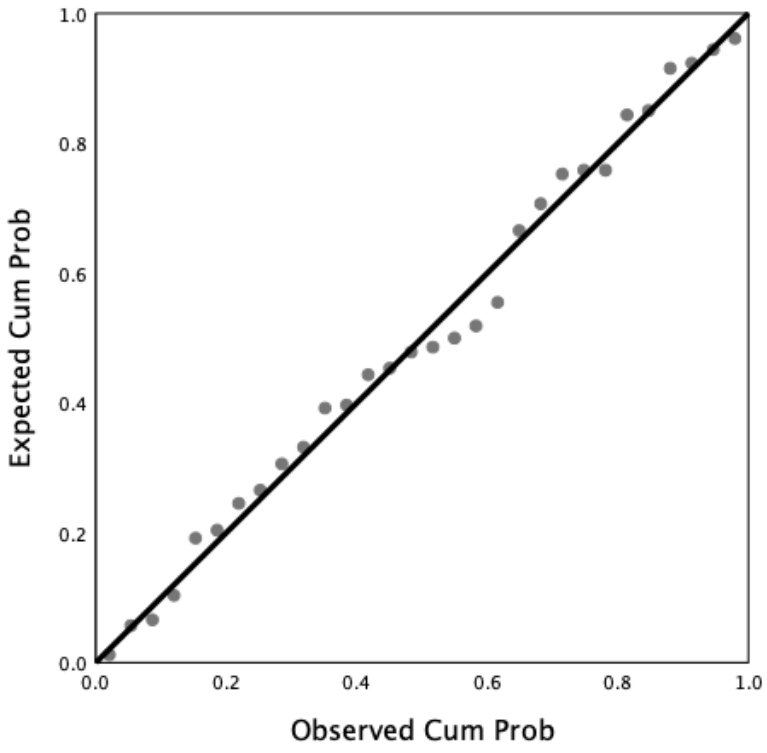
Note. Plot shows normality.

Figure C4. *Residual Scatterplot for WB and RCS*



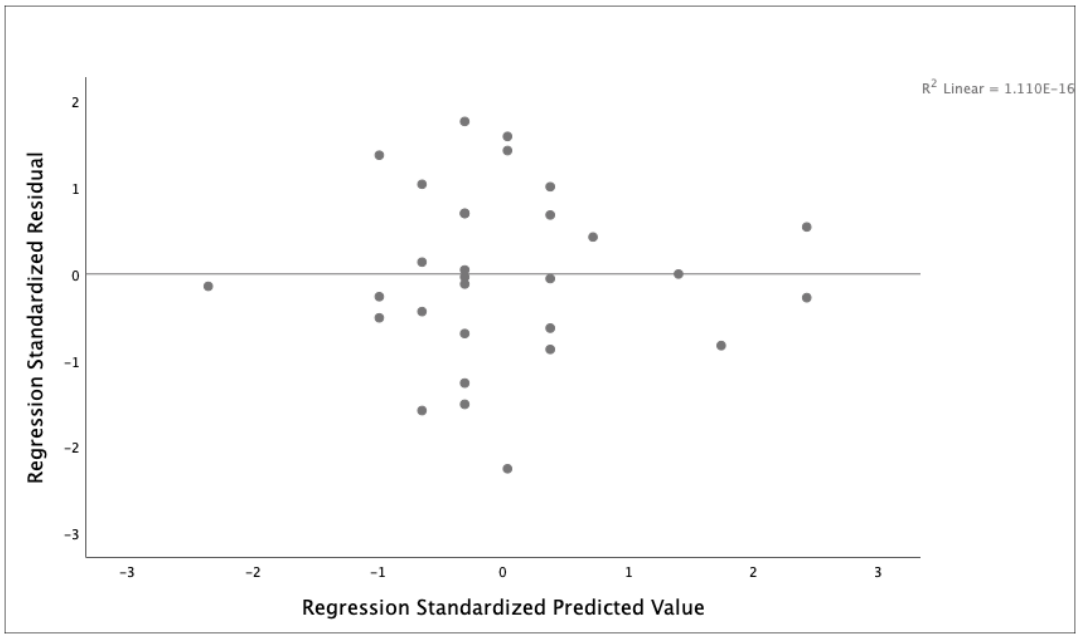
Note. Homoscedasticity may be slightly violated.

Figure C5. *Residual P-P Plot for WB and SIF.IP*



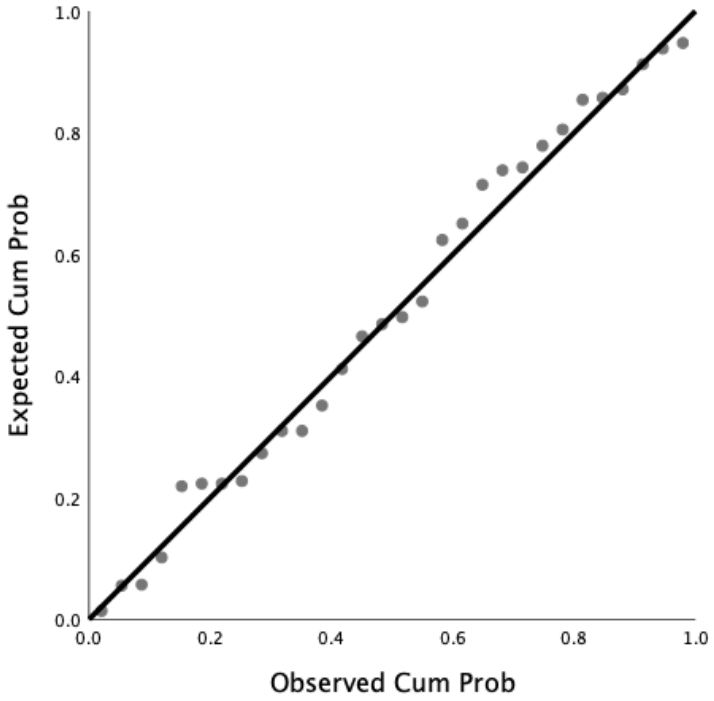
Note. Plot displays normality.

Figure C6. *Residual Scatterplot for WB and SIF.IP*



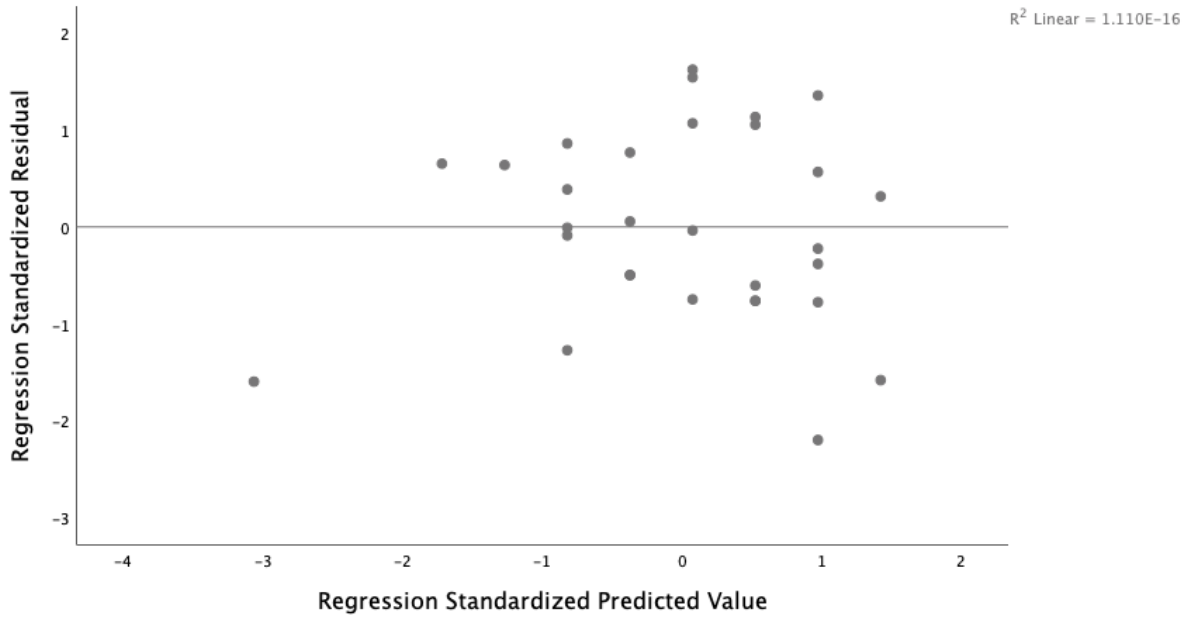
Note. Homoscedasticity is slightly violated.

Figure C7. *Residual P-P Plot for WB and SIF.SP*



Note. P-P Plot displays normality.

Figure C8. *Residual Scatterplot for WB and SIF.SP*



Note. Homoscedasticity is not violated.

Output C1. *Output for the mediation analysis with SIF.SP as mediator*

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.0 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : WB
    X  : RCS
    M  : SIF.SP

Sample
Size:  30

**************************************************************************
OUTCOME VARIABLE:
 SIF.SP

Model Summary
       R       R-sq      MSE     F(HC4)      df1      df2        p
      .0310   .0010     .0357   .0157     1.0000    28.0000     .9010

Model
              coeff    se(HC4)          t          p       LLCI       ULCI
constant      .0335      .1760      .1905      .8503     -.3270      .3940
```

```
RCS          -.0008      .0063     -.1255      .9010     -.0136      .0121

Standardized coefficients
         coeff
RCS     -.0310

**************************************************************************
OUTCOME VARIABLE:
 WB

Model Summary
        R       R-sq        MSE     F(HC4)        df1        df2          p
      .7786    .6062    65.5371    25.5086     2.0000    27.0000      .0000

Model
              coeff    se(HC4)          t          p       LLCI       ULCI
constant    62.4212     5.7047    10.9421      .0000    50.7159    74.1266
RCS          1.3243      .2240     5.9134      .0000      .8648     1.7839
SIF.SP       -.5613    14.7125     -.0382      .9698   -30.7497    29.6271

Standardized coefficients
            coeff
RCS         .7783
SIF.SP     -.0084

************************* TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 WB

Model Summary
     R       R-sq        MSE     F(HC4)        df1        df2          p
   .7785    .6061    63.2077    53.9864     1.0000    28.0000      .0000

Model
              coeff    se(HC4)          t          p       LLCI       ULCI
constant    62.4024     4.2973    14.5213      .0000    53.5995    71.2052
RCS          1.3248      .1803     7.3475      .0000      .9554     1.6941

Standardized coefficients
         coeff
RCS      .7785

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
  Effect    se(HC4)          t          p       LLCI       ULCI       c_cs
  1.3248      .1803     7.3475      .0000      .9554     1.6941      .7785

Direct effect of X on Y
 Effect    se(HC4)          t          p       LLCI       ULCI      c'_cs
 1.3243      .2240     5.9134      .0000      .8648     1.7839      .7783

Indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
SIF.SP      .0004      .0501     -.0750      .1342

Completely standardized indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
SIF.SP      .0003      .0287     -.0448      .0755

*********************** ANALYSIS NOTES AND ERRORS ************************
```

```
Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

NOTE: A heteroscedasticity consistent standard error and covariance matrix
estimator was used.

------ END MATRIX -----
```

Note. X|M is a significant predictor of Y: b = 1.324, p <.001.

X is not a significant predictor of M: b = -.001, p =.901.

M|X is not a significant predictor of Y: b = -.561, p =.97.

X is a significant predictor on Y: b = 1.325, p <.001.

Output C2. *Output for the mediation analysis with SIF.IP as mediator*

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.0 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : WB
    X  : RCS
    M  : SIF.IP

Sample
Size:  30

**************************************************************************
OUTCOME VARIABLE:
 SIF.IP

Model Summary
      R       R-sq        MSE     F(HC4)        df1        df2          p
    .2347      .0551      .0583     1.0927     1.0000    28.0000      .3048

Model
              coeff    se(HC4)          t          p       LLCI       ULCI
constant      .2035      .1853     1.0983      .2814     -.1761      .5832
RCS          -.0078      .0075    -1.0453      .3048     -.0232      .0075

Standardized coefficients
         coeff
RCS     -.2347

**************************************************************************
```

```
OUTCOME VARIABLE:
 WB

Model Summary
        R       R-sq        MSE     F(HC4)        df1        df2          p
    .7828      .6128    64.4328    21.8803     2.0000    27.0000      .0000

Model
             coeff    se(HC4)          t          p       LLCI       ULCI
constant   63.2770     4.5177    14.0064      .0000    54.0071    72.5469
RCS         1.2911      .1981     6.5185      .0000     .8847     1.6976
SIF.IP     -4.2969     7.5856     -.5665      .5758   -19.8618    11.2679

Standardized coefficients
           coeff
RCS         .7588
SIF.IP     -.0842

************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
 WB

Model Summary
       R       R-sq        MSE     F(HC4)        df1        df2          p
   .7785      .6061    63.2077    53.9864     1.0000    28.0000      .0000

Model
             coeff    se(HC4)          t          p       LLCI       ULCI
constant   62.4024     4.2973    14.5213      .0000    53.5995    71.2052
RCS         1.3248      .1803     7.3475      .0000     .9554     1.6941

Standardized coefficients
         coeff
RCS      .7785

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************

Total effect of X on Y
   Effect    se(HC4)          t          p       LLCI       ULCI       c_cs
   1.3248      .1803     7.3475      .0000      .9554     1.6941      .7785

Direct effect of X on Y
   Effect    se(HC4)          t          p       LLCI       ULCI      c'_cs
   1.2911      .1981     6.5185      .0000      .8847     1.6976      .7588

Indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
SIF.IP      .0336      .0632     -.1298      .1433

Completely standardized indirect effect(s) of X on Y:
           Effect     BootSE   BootLLCI   BootULCI
SIF.IP      .0198      .0368     -.0764      .0820

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000
```

```
NOTE: A heteroscedasticity consistent standard error and covariance matrix
estimator was used.

------ END MATRIX -----
```

Note. X|M is a significant predictor of Y: b = 1.291, p < .001.

X is not a significant predictor of M: b = -.008, p = .305.

M|X is not a significant predictor of Y: b = -4.297, p= .576.

X is a significant predictor on Y: b = 1.325, p < .001.